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QUARTERLY MONITORING REPORT
FOURTH QUARTER - 2002
AND
INTERIM REMEDIAL ACTION PLAN

PROJECT SITE:
Oakland Truck Stop
1107 5th Street
Oakland, California

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Project No. 3628
December 31, 2002

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FOURTH QUARTER - 2002
AND
INTERIM REMEDIAL ACTION PLAN

Oakland Truck Stop
1107 5th Street
Oakland, California
Alameda County Fuel Leak Site No. RO0000234

By W.A. Craig, Inc.

Project No. 3628
December 31, 2002

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Senior Geologist

INTRODUCTION

This report has been prepared as part of an ongoing investigation of subsurface contamination at the Oakland Truck Stop in Oakland, California. The work is being performed by W.A. Craig, Inc. (WAC) on behalf of Rinehart Distributing, Inc. The lead agency overseeing this investigation is Alameda County Environmental Health Care Services (ACHCS). The corrective action case has been designated as Alameda County Fuel Leak Site No. RO0000234.

Site Location and Description

The Oakland Truck Stop (the "Site") is located at 1107 5th Street in Oakland, California (**Figure 1**). The property is owned by Mr. Tony Muir, who leases the Site to Rino Pacific, LLC. and Rinehart Distributing, Inc (Rinehart). The Site is located in a commercial and industrial part of west Oakland. A service station building, two underground storage tanks, four fuel dispenser islands, a truck scale, and a scale house currently occupy the Site. **Figure 2** shows the current site layout.

The property is bounded on the north by 5th Street and the Nimitz Freeway, on the west by Adeline Street, on the east by Chestnut Street and on the south by Oliver's Hoffbrau and parking lot. The surface elevation is approximately 10 feet above mean sea level. The topography is flat, with a gentle slope to the southwest. The water table fluctuates seasonally between about 10 inches and 4 feet below grade. The nearest surface water body is the Oakland Estuary, located approximately 2,400 feet south of the Site.

WAC is conducting quarterly groundwater monitoring at the Site. The direction of groundwater flow has varied from southwest to north, and may be affected by localized recharge from leaking water or sewer lines. Because of this variability, interpretation of the groundwater gradient is uncertain.

Site Background

The Site was developed as a truck stop approximately 40 years ago and has been in operation throughout the period. Three 10,000-gallon underground storage tanks (USTs) and one 8,000-gallon UST were formerly maintained at the Site. All four USTs were of single-walled steel construction. Of the 10,000-gallon USTs, two contained diesel fuel and one contained mid-grade unleaded gasoline. The 8,000-gallon UST contained regular unleaded gasoline. Prior to a recent remodel of the Site, fuel product lines were single-walled fiberglass.

In 1995 an unauthorized release of fuel occurred as a result of a leak in a product line. Product lines associated with this release were replaced as soon as the leak was discovered. Interim

cleanup of the spill was performed by installing two product recovery sumps with skimmers in the vicinity of the release. Approximately six gallons of gasoline were recovered and the floating product thickness was reduced to a sheen in the recovery wells. The sumps were removed from the Site during leaseholder improvements in 1999. Groundwater monitoring wells MW-1 through MW-3 were installed in November 1996.

The four single-walled USTs were replaced with two 15,000-gallon, double-wall fiberglass USTs in March 1999. Contaminated soil and groundwater were removed during the UST replacements. The following table presents a summary of interim remedial activities performed at the Site by Trinity Excavating and Engineering, Inc. of Santa Rosa, California.

Feb 8-10, 1999	Excavated to top of tanks and rinsed four USTs
Feb 11, 1999	Removed and disposed the USTs offsite (observed by Fire Inspector)
Mar 3-4, 1999	Removed approximately 2,100 tons of contaminated soil from excavation bottom and sides before sampling as directed by Fire Inspector. Tested excavation and stockpile samples. Removed groundwater from pit as needed. Pumped approximately 33,000 gallons of contaminated groundwater into temporary storage tanks.
Feb 24–May 19, 1999	Loaded, manifested, and disposed 2,000 tons of contaminated soil at the Forward non-hazardous disposal facility near Stockton, California.
Feb 11–May 6, 1999	Placed approximately 1,700 tons of clean imported backfill.
May 3-5, 1999	Disposed contaminated water at Seaport Environmental.

Groundwater monitoring wells MW-4 through MW-9 were installed in August of 2000. Petroleum hydrocarbons were detected in each of the wells. Well MW-7 yielded the highest petroleum concentrations and free-phase product was observed periodically in this same well.

In a July 27, 2001, letter to Rinehart, ACHCS requested that additional investigation be performed to delineate the extent of petroleum hydrocarbons contamination both onsite and offsite. A *Site Investigation Work Plan* was prepared by WAC dated October 22, 2001. The work plan was approved by the ACHCS in a letter to the owner dated October 30, 2001. WAC installed two additional monitoring wells on the adjacent Oliver's Hoffbrau property and replaced onsite monitoring well (MW-3) on May 8, 2002.

On May 23, 2002, ACHCS requested that Rinehart conduct an investigation to determine whether hydrocarbons were migrating offsite along preferential pathways such as utility trenches underlying 5th Street and Chestnut Street. WAC prepared the *Subsurface Conduit Investigation Work Plan* dated June 28, 2002 for Rinehart. The work plan was approved by the ACHCS in a letter to the owner dated July 17, 2002. WAC completed the utility conduit sampling on July 19, 2002. Elevated concentrations of petroleum hydrocarbons were detected in groundwater samples

collected along the sewer trench along 5th Street. The conduit investigation found that petroleum hydrocarbons, especially MTBE, are migrating along the sewer trench.

Beneficial Uses of Groundwater

Corrective actions at the Oakland Truck Stop are subject to several regulatory considerations. The shallow aquifer beneath the Site has no beneficial use as a drinking water resource due to the high total dissolved solids concentration (TDS >3,000 mg/L). Proposed Groundwater Amendments to the Water Quality Control Plan (Basin Plan) of April 2000 state that shallow groundwater to a depth of about 100 feet in portions of the East Bay Plain is often brackish due to seawater intrusion. However, the Basin Plan also indicates that well yields may be sufficient for industrial or irrigation uses. In the East Bay Plain there are deep aquifers that will continue to be designated as potential drinking water resources. Under this setting, the deep aquifers (defined as aquifers below the Yerba Buena Mud) are subject to protection as potential drinking water resources.

The Basin Plan states that in areas where groundwater has no beneficial use as a drinking water resource, remedial action objectives should be protective of ecological receptors, human health, and potential non-potable uses for groundwater (e.g., irrigation or industrial process supply). In addition, State Board Resolution No. 92-49 states that polluted sites shall continue to be required to demonstrate that 1) reasonably adequate source removal has occurred, 2) the plume has been reasonably defined both laterally and vertically, and 3) a long-term monitoring program is established to verify that the plume is stable and will not impact ecological receptors or human health (e.g., from volatilization into trenches and buildings).

Site Conceptual Model

The conceptual model for the Site is based on the data collected through November 2002, relying heavily on information collected during the sewer corridor investigation. The purpose of this section is to summarize Site conditions and provide a rationale for corrective action.

- The Site has high concentrations of petroleum hydrocarbons in the shallow groundwater (i.e., from 4' to 15' bgs).

- The Site is underlain at a depth of 12 to 15 feet bgs by the silty-clay and clayey-silt known as the Bay Mud. This unit limits the vertical migration of petroleum hydrocarbons. **Figures 3 and 4** are cross sections that model the underlying structure of the Site. **Figure 2** shows the locations of the cross sections.

- Hydrocarbon concentrations in groundwater are highest in wells downgradient (north) from the UST pit. Free-phase petroleum has been observed in well MW-7.

- A sanitary sewer pipeline that runs along 5th Street, the north (downgradient) side of the Site appears to be a pathway for lateral migration of petroleum hydrocarbons offsite.

- There are no beneficial uses of groundwater within 1,000 feet of the Site.

- MtBE is the primary constituent of concern.

- Degradation by-products of MtBE (e.g., tBA) have only recently been detected in groundwater samples at the Site, indicating limited natural attenuation of MtBE.

Clean up Goals

The Oakland Risk-based Corrective Action (RBCA) process was used to develop clean-up goals for the site. **Appendix A** contains the checklist and exposure pathway assessment. Currently exposure scenarios include inhalation of volatilized hydrocarbons to outdoor air in a commercial/industrial setting. The Site does not qualify to use the Oakland Risk-bases screening levels (RBSL) for a closure assessment, since non-aqueous phase petroleum has been identified, and at least one preferential pathway for off-site migration has been identified. Therefore the current clean up goals are the following:

- Remove non-aqueous phase petroleum (free-product) in the vicinity of well MW-7.

- Reduce hydrocarbon concentrations in the source area to mitigate offsite migration via the sanitary sewer corridor.

After these two interim remedial goals are achieved, the Oakland RBCA process will used to select the final remedial action. Until these interim goals are met, the use of numeric analysis for risk-based decisions is not appropriate.

GROUNDWATER MONITORING SCOPE OF WORK

The scope of work performed during this quarter included the following tasks:

- Measured dissolved oxygen concentrations and static water levels in eight onsite and two offsite monitoring wells;

- Purged each monitoring well of stagnant water while collecting field measurements of water quality parameters;
- Collected groundwater samples from the 10 monitoring wells;
- Analyzed the groundwater samples for: TPH (gasoline and diesel range, by Method 8015CM); MtBE, benzene, toluene, ethylbenzene, and xylenes (BTEX, by Method 8021B); and the fuel additives DIPE, EtBE, MtBE, TAME, tBA, methanol, ethanol, EDB, and 1,2-DCA (by Method 8260B; see notes to **Table 3** for chemical names);
- Prepared this *Quarterly Monitoring Report and Interim Remedial Action Plan.*

FIELD METHODS

Groundwater Elevation Measurements

Quarterly monitoring was conducted on November 11, 2002. WAC staff first measured water levels in the 10 monitoring wells installed for this investigation. The measurements were made using an electronic well sounder. Prior to taking a measurement, the cap was removed from each well and the water level was allowed to equilibrate with atmospheric pressure for approximately 30 minutes. The static depth-to-water measurements were subtracted from the top of casing elevations to obtain groundwater elevations (**Table 1**). The depth-to-water measurements were also used to calculate the volume of standing water in each well.

Groundwater Purging and Sampling

After taking the water level measurements, WAC staff purged and sampled groundwater from the 10 monitoring wells. **Free product (as a sheen) was noted in MW-7.** At least three volumes of standing water were purged from each well prior to collecting the groundwater samples. Purging was accomplished using a disposable polyethylene bailer. The temperature, pH, conductivity, and turbidity of the groundwater were intermittently monitored with portable instrumentation during purging of each well. Dissolved oxygen measurements were also made at the end of purging. The resulting water quality measurements were recorded on Sampling Logs (**Appendix B**).

Groundwater samples were collected using disposable polyethylene bailers and then decanted into 40-ml vials specific to volatile organic analyses (VOA vials). The sample vials were provided by the laboratory and were pre-preserved with hydrochloric acid (HCl). Samples were stored in the field in ice chests cooled with ice until delivery to a California DHS-certified laboratory. The samples were submitted under chain-of-custody control to McCampbell Analytical, Inc. (MAI), of Pacheco, California.

Reusable down-well equipment was decontaminated after each use by washing in a laboratory-grade detergent solution followed by a tap water or deionized water rinse. Well purge water was placed into 55-gallon DOT drums pending the receipt of the laboratory analyses.

DATA EVALUATION

Groundwater Elevations

Groundwater elevation data are summarized in **Table 1**. Groundwater elevation contours for the Site are depicted on **Figure 5**. The groundwater flow direction is mostly to the north. This flow direction is consistent with the previous two quarters groundwater flow direction.

Hydrographs for selected monitoring wells are presented on **Figure 6**. These graphs indicate there may be a seasonal cycle in groundwater elevations. The water levels generally appear to rise in winter and drop in summer. The magnitude of the rise and fall is about ½ to 1 foot. Water levels in the two offsite monitoring wells (MW-10 and MW-11) have been higher or lower than expected when compared with the water table elevations in the onsite wells. Well MW-11 appears to be in an area of different hydrogeologic conditions compared to the remaining wells at the site.

Groundwater Sampling Results

The wells were purged and sampled on November 11, 2002. The dissolved oxygen (DO) concentration was measured in each well prior to sampling. The DO readings are summarized in **Table 2**. Other field water quality measurements are noted on the Sampling Logs in **Appendix B**. The DO measurements indicate that oxygen concentrations remain quite low in all wells, at less than 0.5 milligrams per liter (mg/L). A DO concentration less than 0.5 mg/L is within the environmental range of anaerobic bacteria. Shallow groundwater at the Site is generally at 4% or less of the potential oxygen saturation concentration. The specific conductance (SC) of the groundwater (an indicator of TDS concentration) generally ranges between 1,000 and 2,000 microSiemens (uS). However, the SC in MW-10 is only about 570 uS, and the SC in MW-1 and MW-9 ranges from 4,000 to 5,000 uS.

Groundwater samples were analyzed for TPH (gasoline and diesel range) using EPA Method 8015C (modified), for BTEX and MtBE using EPA Method 8021B, and for fuel oxygenates using EPA Method 8260B. The Method 8260B analysis for MtBE is generally considered to be more accurate than Method 8021B. Consequently, the discussions in this report will use the MtBE results determined by the Method 8260B analyses. Laboratory data are summarized in **Table 3** and the laboratory analytical reports and chain-of-custody form are included in **Appendix C**.

MtBE exceeded the (13 micrograms per liter (µg/L)) California Primary Maximum Contaminant Level (MCL) in the eight onsite monitoring wells and in one offsite well (MW-11). Detected MtBE concentrations ranged from a low of 0.71 µg/L in offsite well MW-10 to a high of 84,000 µg/L in MW-4. MtBE concentrations remain above 50,000 µg/L in wells MW-4, MW-7, and MW-8. TPH-d was detected in the wells at concentrations ranging from 100 µg/L in MW-10 to 240,000 µg/L in MW-7. BTEX and TPH-g were generally below the laboratory reporting limits in all wells except MW-7, which had concentrations of these contaminants an order of magnitude larger than the MCLs (**Table 3**).

Figure 7 depicts the known lateral extent of MtBE in shallow groundwater in November 2002. MtBE concentrations are highest along the northern side of the Site, where the steel-walled USTs used to be, and where fuel dispenser islands are located. Graphs of MtBE versus time for the highest concentration monitoring wells are depicted on **Figure 8**. In general, these graphs show that MtBE concentrations have been decreasing in onsite wells MW-4, MW-5, MW-6, MW-7, and MW-8 since May 2001.

Other fuel additives commonly associated with gasoline have not been detected above the laboratory detection limits (**Table 3**). The single exception is tertiary-butyl alcohol (tBA), which was detected in wells MW-5 and MW-6. The tBA concentration in MW-6 was 3,800 µg/L. This constituent is sometimes produced by the incomplete breakdown (oxidation) of MtBE. The California Department of Health Services (DHS) has established a drinking water Action Level of 12 µg/L for tBA.

CONCLUSIONS

The quarterly groundwater monitoring data for August 2002 indicate that the gradient is northerly, similar to last quarter. Dissolved oxygen concentrations remain in the anaerobic range in all wells, probably due to the biodegradation of hydrocarbons and the resulting consumption of DO. The specific conductance (conductivity) of the groundwater indicates that TDS levels are too high for use as potable water, and particularly in wells MW-1 and MW-9. In contrast, however, the SC in well MW-10 is much lower than the other wells (at around 570 uS), and falls within the potable water range. This suggests that there may be a leaking water line in the vicinity of well MW-10, which would bias the sampling data from that well.

The laboratory data indicate little significant change in contaminant concentrations since last quarter. However, there appears to be a trend of slowly decreasing concentrations over the past year. MtBE levels exceed the MCL in all wells except for MW-10. The heaviest contamination is centered along the northern side of the Site. The distribution of MtBE concentrations among the wells indicates that the plume has probably spread offsite a short distance to the south, and an

undetermined distance to the north. The sampling results from the sewer trench borings suggest high concentrations of contaminants directly north of the Site. The borings along Chestnut Street indicate little migration of contaminants east of the Site.

RECOMMENDATIONS

WAC recommends the continuation of quarterly groundwater monitoring and implementation of interim remedial measures described in the following section.

INTERIM REMEDIAL ACTION WORK PLAN

This Interim Remedial Action Plan consists of four major tasks. The first task is installation of additional monitoring wells across 5th Street to the north of the site, and at the corner of 5th Street and Chestnut. The second is a free product removal from well MW-7, which has a history of free product. The third is additional investigation along the sewer corridor adjacent to 5th Street. The fourth is the installation of an interim treatment system to reduce petroleum hydrocarbon concentrations in wells MW-4, MW-5, MW-6, MW-7, and MW-8.

Feasibility of Remedial Technology

Of the available remedial technologies, whichever is ultimately chosen should be designed to remove the source of the hydrocarbon plume, and should be capable of removing or destroying MtBE. Particular emphasis should be placed on the removal of MtBE due to its relatively high solubility in water, low vapor pressure, and resistance to bioattenuation. Targeting the source of MtBE should result in the destruction or removal of the other fuel hydrocarbons. By targeting the highest concentrations of hydrocarbons, the maximum mass will be removed or destroyed for the minimum cost.

Among the serious alternatives are:

- Excavation,
- Air Sparging, with Vapor Extraction,
- Groundwater Pump and Treat, and
- Ozone Sparging.

A discussion of the limitations and advantages of each alternative follows:

Excavation

- Excavation has already been performed at the Site, effectively removing a large volume of highly impacted soil and groundwater.

- Remaining impacted soils are mostly at or below the water table, and would seriously disrupt Site operations.

Additional excavation is not a feasible alternative.

Air Sparging and Vapor Extraction

- Requires PG&E service drop and associated delays.

- MtBE has a high solubility (4.8 E+4 mg/L) and a low vapor pressure (249 mm Hg), thus severely limiting its ability to be captured in the vapor phase.

- Vapor extraction may be ineffective because the majority of hydrocarbons remain below the water table as discussed above.

- The ratio of cost to mass of hydrocarbons and MtBE removed would be prohibitively high.

- Promotes aerobic biodegradation.

- The success of hydrocarbon removal from vapor extraction can be well documented in terms of mass removed.

Air sparging and vapor extraction is not a feasible alternative.

Groundwater Pump and Treat

- Requires PG&E service drop and associated delays.

- Requires a discharge permit from East Bay Municipal Utilities District and associated delays.

- Pumping of groundwater will not effectively remove any free phase hydrocarbons in the unsaturated or capillary zones.

- Although effective in controlling hydrocarbon plume movement, groundwater pumping and treatment is costly and slow.

- The success of hydrocarbon removal from water pumping can be well documented in terms of mass removed.

Groundwater pump and treatment is not a feasible alternative.

Ozone Sparging

- Requires no special electrical service drop and associated delays (runs from standard 110 volt power, dedicated 20 amp circuit required).

- Requires no discharge permit from the East Bay Municipal Utility District since there is no discharge in this in-situ process.

- Does not require encroachment onto 5th Street.

- Breakdown of ozone (O_3) provides an oxygen rich environment that promotes aerobic biodegradation.

- Ozone reacts directly with petroleum hydrocarbons including MtBE (through oxidation) and will break them down to carbon dioxide and water (ozone oxidation potential = 2.07 volts).

- Ozone microbubbles are small in diameter (0.3 to 200 microns) and the high surface area to volume ratio allows penetration of fine-grained saturated sediments.

- Ozone is highly soluble in water (600 mg/L at 20 degrees C), more than 12 times the solubility of oxygen.

- Gaseous ozone bubbles injected into groundwater cause dissolved hydrocarbons to partition into the vapor phase according to Henry's law, where they are oxidized.

- Ozone is relatively reactive, and will not persist in the environment.

- The coarse-grained migration pathways in the subsurface at the Site are attractive target areas for ozone injection.

- The ratio of cost to mass of hydrocarbons and MtBE removed will be low, if the technology is successfully applied.

- Case studies indicate that the ratio of ozone mass injection to hydrocarbon mass destroyed exceeds stoichiometrically calculated rates up to 1:1.

- Case studies indicate rapid MtBE degradation rates.

Results from this system are monitored in real time by measuring the dissolved oxygen concentration and the decrease in hydrocarbon concentrations in nearby wells. It is imperative that measures be taken to ensure that the system is delivering ozone to targeted areas. The porosity of the aquifer, the groundwater velocity, and the distance to the monitoring well control the efficiency of this remedial measure.

Selection of Treatment Technology

Based on the advantages and limitations of the above described technologies, and our understanding of Site conditions WAC recommends the application of ozone sparging at the Site.

SCOPE OF WORK

The goals of the proposed scope of work are the following:

- Remove non-aqueous phase petroleum (free-product) in the vicinity of well MW-7.

- Reduce hydrocarbon concentrations in the source area to mitigate offsite migration via the sanitary sewer corridor.

- Evaluate the lateral migration of petroleum hydrocarbons from the Site.

The scope of work to complete the IRAP tasks will consist of the following elements:

Phase 1 – Obtain regulatory approval from the ACHCS.

Phase 2 – Obtain pre-approval of estimated costs for remediation and monitoring.

Phase 3 – Install two groundwater monitoring wells on the north side of 5th Street.

Phase 4 – Install a hydrocarbon skimmer in well MW-7.

Phase 5 – Install Hydropunch borings along 5th Street sewer corridor.

Phase 6 - Install and operate the ozone sparging system.

Phase 1 - Obtain Regulatory Approval

Submittal of this work plan to the ACHCS will constitute Phase 1 of the project. WAC will address questions and comments and incorporate any appropriate modifications suggested by ACHCS.

Phase 2 - Obtain Pre-Approval of Estimated Costs for Remediation and Monitoring

Following approval of the scope of work, WAC will prepare a cost estimate to implement the approved IRAP. This cost estimate will be forwarded to the California State Water Resources Control Board Underground Storage Tank Cleanup Fund for pre-approval of cost elements.

Phase 3 - Install Additional Groundwater Monitoring Wells

In order to evaluate downgradient extent of petroleum contaminant plume, two groundwater monitoring wells will be installed on the BART property located north of the Site (across 5th Street), and one well will be installed at the corner of 5th Street and Chestnut Street. **Figure 2** shows the proposed locations for wells MW-12, MW-13, and MW-14.

Well Permits and Utility Clearance

Alameda County Public Works Agency requires that well permits be obtained prior to the installation of monitoring wells or temporary borings. Well permit applications will be filed with the County at least 5 days prior to installation of the wells. The County will be given at least 48-hours notice prior to the installation of wells so that they may observe the installation of the annular seal.

The City of Oakland requires encroachment and excavation permits for wells installed in the City of Oakland's right-of-way. These permits will be obtained, if necessary.

Per requirements of California law, underground service alert (USA) will be notified of the intent to perform subsurface investigation at the Site. USA will notify public and private utility companies and each utility will send a field representative to mark the location of underground utilities owned and maintained by each utility company.

Drilling Procedures

The new monitoring wells will be constructed using a truck-mounted hollow-stem auger drill rig. A WAC geologist will supervise drilling and sampling operations. Drilling will cease approximately 10 feet below the first encountered water-bearing zone.

Short screen wells

Borings will be continuously logged in the field using the Unified Soil Classification System. The field geologist will observe significant changes in material penetrated, changes in drilling conditions, record lithologic changes, the relative moisture content of soils and note water-producing zones. This record will be used later to prepare detailed boring logs. Lithologic descriptions will include soil type, color, grain, size, texture, odor, degree of induration, carbonate content, presence of hydrocarbons and other pertinent information. Soil cuttings from the drilling operations will be stored on-site in 55-gallon DOT approved drums. These investigation-derived wastes will be characterized as hazardous or non-hazardous based of the results of the investigation. Disposal of these wastes is not included in this scope of work.

Soil Sample Collection

One soil sample will be collected from each of the three monitoring wells at the soil-groundwater interface. The sample will be collected using a modified California sampler lined with three 6-inch long brass tubes. Prior to sampling, the sampler will be washed with a laboratory grade detergent solution and triple rinsed with tap water.

The sampler will be placed down the boring and driven to the desired depth using a 140-pound hammer dropped approximately 30 inches. Blow counts for each 6-inch sampling interval will be recorded on the boring log. Immediately after removing the brass tubes from the sampler, 5-gram aliquots of soil will be collected using an EnCore Sampler. This sampler meets all requirements for the collection of soil samples for volatile organic analytes described in EPA Method 5030. The EnCore sampler will be pushed into the soil cores using the EnCore T-handle until the coring sampler is completely full. The cap coring body will be properly seated and locked in place to form an airtight seal. The EnCore samplers will be sealed in a foil pouch.

The zipper foil pouch will be labeled indicating project number, sample number, sample depth, date, and collection time. The same information will be recorded on the chain of custody form. EnCore samplers will be placed in a cooler with frozen gel packs or ice. The sample cooler will be delivered to the analytical laboratory within 24 hours of collection. Soil samples will be extracted within 48 hours of receipt by the lab and will be kept at 4 degrees Celsius pending analysis.

Monitoring Well Construction

Monitoring wells will be constructed of two-inch diameter, flush-threaded, Schedule-40 PVC well casing. The wells will be constructed through the hollow-stem augers, with materials placed from the bottom of the borehole to the ground surface. The screened interval of the well will be factory slotted with a slot size of 0.010 inches. The well screen will be installed to approximately 10-feet below the first encountered groundwater, or as conditions warrant. The screened section annulus will be packed with clean #2/12 graded sand. The monitoring well sand

filter pack will extend two feet above the well screen as per section 2649(d)(5) of the California Code of Regulations.

Hydrated bentonite pellets will be placed above the sand as a sealing material. The well will be sealed from the bentonite seal to the ground surface using a Portland cement/bentonite grout. No glues or other solvents will be used in the construction of the wells. The wells have not been designed to provide optimum flow but are intended to provide water samples that are representative of water quality in the uppermost water-bearing zone.

The wellheads will be protected from vandalism using a locking expansion-plug cap and will be housed within traffic-rated boxes to protect the wells from traffic and surface water runoff. The well sealing material (grout) will be allowed to set for a period of 72 hours prior to development or sampling.

Well Development

Monitoring wells will be developed by pumping and surging. A surge block will be lowered to the screen interval and WAC will manually pull and push the surge block through the screened interval to remove sediment and fines from the well. A minimum of five well casings will be purged. Field parameters, including color, odor, free-phase liquid, turbidity, specific-conductance, temperature, and pH, will be monitored during the development of the wells. Development will continue until field parameters stabilize or until the water is relatively clear and free of sediment and fines.

Monitoring Well Surveying

The monitoring wells will be surveyed for horizontal and vertical control following the guidelines for electronic data submittals to the SWRCB's GEOTRACKER system. A permanent mark on the top of the well casing such as an indelible mark or notch will reference the surveyed point on the casing. Subsequent water level measurements will be tied to this reference point.

Groundwater Sample Collection

The following description relates to each quarterly groundwater-sampling event. Prior to sampling, water levels will be measured using an electronic water level sounder. The elevation of the water table will be determined by subtracting the depth of water below the top of casing from the top of casing elevation as determined by the surveyor.

At least three well volumes will be purged from the well to ensure that the groundwater sample is representative of groundwater quality in the water-bearing zone. The temperature, pH and specific conductivity of the water will be monitored during the purging of the well to ensure the water sample is representative of water quality in the water-bearing zone. A sample will be collected after these parameters have stabilized. The wells will be purged using a 12-volt

submersible pump or a disposable polyethylene bailer. Should the well become completely evacuated during purging, samples will be collected after the well has recovered to 80 percent of its initial water level.

Groundwater samples will be decanted from the bailer into laboratory supplied containers, approved for the analyses required. The samples will be immediately placed in refrigerated storage for delivery to the laboratory. Groundwater samples will be labeled with the project name, project number, sample number, sample depth, date and collection time. The same information will be recorded on the chain of custody form. After collection, the groundwater samples will be placed in a cooler with ice. The sample cooler will be delivered to MAI in Pacheco, California within 24 hours of collection.

Phase 4 – Install a Hydrocarbon Skimmer in Well MW-7

A hydrocarbon skimmer will be installed in well MW-7 to capture non-aqueous phase petroleum hydrocarbons when present in the well. The skimmer will be evaluated weekly to assess the volume and recharge of the free phase hydrocarbons in the well. After 4 weeks of observations, a schedule will be developed to maximize removal of non-aqueous phase hydrocarbons from the well.

Phase 5 – Install Hydropunch Borings Along 5th Street Sewer Corridor.

Based on the detected concentrations of petroleum hydrocarbons in the previous sewer corridor borings, two additional borings will be installed both to the east and west along the sewer corridor of 5th Street. **Figure 2** shows the proposed boring locations.

Boring Permits and Utility Clearance

Alameda County Public Works Agency requires that boring permits be obtained prior to the installation of monitoring wells or temporary borings. Well permit applications will be filed with the County at least 5 days prior to installation of the wells. The County will be given at least 48-hours notice prior to the installation of wells so that they may observe the installation of the annular seal.

The City of Oakland requires excavation permits for soil borings in the City's right-of-way. The excavation permit will be obtained and required time limits for notification will be observed. The excavation permit application includes development of a traffic management plan, to ensure safe working conditions and public safety during drilling operations.

Per requirements of California law, underground service alert (USA) will be notified of the intent to perform subsurface investigation at the Site. USA will notify public and private utility

companies and each utility will send a field representative to mark the location of underground utilities owned and maintained by each utility company.

Drilling Procedures

Soil borings will be drilled using a truck-mounted direct-push drilling rig (e.g., Geoprobe). Once the first encountered groundwater is identified, the drilling rig will push a depth discrete groundwater sampling tool (e.g., Hydropunch) to approximately 3 feet below the first encountered water-bearing zone. A WAC geologist will supervise drilling and sampling operations.

Borings will be continuously logged in the field using the Unified Soil Classification System. The field geologist will observe significant changes in material penetrated, changes in drilling conditions, record lithologic changes, the relative moisture content of soils and note water-producing zones. This record will be used later to prepare detailed boring logs. Lithologic descriptions will include soil type, color, grain, size, texture, odor, degree of induration, carbonate content, presence of hydrocarbons and other pertinent information. Soil cuttings from the drilling operations will be stored on-site in 55-gallon DOT approved drums. These investigation-derived wastes will be characterized as hazardous or non-hazardous based of the results of the investigation. Disposal of these wastes is not included in this scope of work.

Soil Sample Collection

One soil sample will be collected from each boring at the soil-groundwater interface. The sample will be collected using a soil sampler lined with an acetate liner. Prior to sampling, the sampler will be washed with a laboratory grade detergent solution and triple rinsed with tap water.

The sampler will be placed down the boring and driven to the desired depth using a hydraulic hammer. Immediately after removing the acetate liner, 5-gram aliquots of soil will be collected using an EnCore Sampler. This sampler meets all requirements for the collection of soil samples for volatile organic analytes described in EPA Method 5030. The EnCore sampler will be pushed into the soil cores using the EnCore T-handle until the coring sampler is completely full. The cap coring body will be properly seated and locked in place to form an airtight seal. The EnCore samplers will be sealed in a foil pouch.

The zipper foil pouch will be labeled indicating project number, sample number, sample depth, date, and collection time. The same information will be recorded on the chain of custody form. EnCore samplers will be placed in a cooler with frozen gel packs or ice. The sample cooler will be delivered to the analytical laboratory within 24 hours of collection. Soil samples will be extracted within 48 hours of receipt by the lab and will be kept at 4 degrees Centigrade pending analysis.

Groundwater Sample Collection

Once the Hydropunch sampling tool is opened in the saturated zone, a mini-bailer will be used to collect groundwater for laboratory analysis. The mini-bailer will be decontaminated between each use using the same techniques as the soil sampler.

Groundwater samples will be decanted from the bailer into laboratory supplied containers, approved for the analyses required. The samples will be immediately placed in refrigerated storage for delivery to the laboratory. Groundwater samples will be labeled with the project number, and sample number. The same information along with the project name and the requested analysis will be recorded on the chain-of-custody form. After collection, the groundwater samples will be placed in a cooler with ice. The sample cooler will be delivered to MAI in Pacheco, California within 24 hours of collection.

After sample collection the borings will be abandoned by backfilling with a neat cement grout per the requirements of Alameda County.

Phase 6 - Install the Ozone Sparge System

The ozone sparge system will be installed along the north portion of the site.

Treatment System Design

Ozone sparge points will be installed at the top of the Bay Mud, in those areas shown on **Figure 7** to have elevated concentrations of MTBE. Specifics?

The proposed system is composed of the KVA C-Sparger ™ panel, a unit that generates and distributes ozone into piping which leads to up to 10 sparge points per panel. The KVA C-Sparger ™ panel rations the available ozone to each sparge point by a cyclic valve and timer apparatus. Ozone is delivered to each sparge point, at a concentration of approximately 6 percent by volume. Each point contains micro-porous diffuser from that disperses ozone microbubbles into the soil void spaces.

Ozone is generated from ionization of oxygen in ambient air or from an oxygen concentrator. The oxygen enriched air from the oxygen concentrator allows up to three times as much ozone (by volume) to be produced in the oxygen separator. The system is capable of delivering ozone to up to 10 circuits according to a programmable timer. The system may produce up to 50 pounds per square inch (psi), and a flow rate of approximately 3 cubic feet per minute (cfm). The mass of ozone produced is approximately five grams per hour using ambient air and up to 15 grams per hour using an oxygen concentrator.

$$\frac{15\,g}{hr} \cdot \frac{20\,hr}{day} \cdot \frac{7\,day}{wk} \cdot \frac{52\,wk}{yr} \approx 109\,kg$$

Figure 9 is a plan view drawing showing the proposed locations of sparge points. The sparge point will be installed in each borehole at the top of the bay mud (approximately 12 feet bgs). **Figure 9** shows the hypothetical radius of influence for the sparge points of approximately 12 feet. In case studies reported in the literature, radii of influence below the water table are 1.5 feet horizontal for each foot the sparge point is below the water table. Thus if the sparge point is 8 feet below the water table, the expected radius of influence is 12 feet. **Figure 9** shows proposed ozone sparge points and hypothetical radii of influence in relation to the existing monitoring wells.

These predictions assume homogeneity and isotropy of soils. Sparge points were located where they are expected to have the greatest impact on the highest concentrations of dissolved hydrocarbons. Injected ozone bubbles are expected follow the same pathways as impacted groundwater. Ozone will disperse vertically upward according to the pathways by which hydrocarbons dispersed in groundwater. The actual ozone distribution pattern will be controlled by Site stratigraphic conditions.

Assuming the manufacturer specification of 3 cfm of ozone/air flow to sparge points, an ozone delivery rate of 15 grams per hour, and a 1:1 ratio of mass ozone delivery to hydrocarbon destruction, and a 20 hour per day use cycle, up to 110 Kg of hydrocarbons will be destroyed annually. This idealized estimate will certainly diverge from reality, due to factors such as natural bioattenuation and potential limitations in ozone distribution associated with the Site stratigraphy.

Treatment System Monitoring

During the first week of system operation, pressure readings to each ozone sparge point will be recorded daily to verify that pressures are within operating ranges. During the first eight weeks of operation, DO, TPH-g, BTEX, fuel oxygenates will be sampled weekly in wells MW-4, MW-5, MW-6, MW-7, and MW-8. Results of the system installation start up, and initial monitoring will be described in a *Remedial Action Report*.

After the initial eight-week start up period, pressure readings will be performed on a monthly basis. Monitoring the system effectiveness will be conducted through assessment of groundwater conditions during the quarterly groundwater monitoring events, especially those wells with high concentrations of petroleum compounds. Remediation system effectiveness assessments will be included in future quarterly monitoring reports.

TABLES

TABLE 1
Groundwater Elevations in Monitoring Wells
1107 5th Street, Oakland, California

Well ID (screen depth)	Date	Casing Elevation	Depth to Water	Groundwater Elevation
MW-1	10/21/96	10.34	5.08	5.26
(10-20)	11/4/96		3.02	7.32
	3/4/97		2.28	8.06
	6/12/97		4.80	5.54
	7/14/97		2.66	7.68
	9/9/97		2.45	7.89
	9/19/97		2.60	7.74
	2/13/98		2.76	7.58
	7/7/98		2.15	8.19
	10/1/98		3.63	6.71
	12/30/98		4.40	5.94
	3/21/00		2.62	7.72
	8/30/00		3.21	7.13
	11/6/00		3.10	7.24
	2/22/01		3.50	6.84
	5/7/01		2.94	7.40
	8/22/01		3.70	6.64
	11/4/01		3.89	6.45
	2/15/02		2.95	7.39
	5/20/02		3.29	7.05
	8/1/02		3.51	6.83
	11/11/02		4.00	6.34
MW-2	10/21/96	7.21	4.66	2.55
(8-13)	11/4/96		4.60	2.61
	3/4/97		3.68	3.53
	6/12/97		3.70	3.51
	7/14/97		4.16	3.05
	9/9/97		3.88	3.33
	9/19/97		4.50	2.71
	2/13/98		3.08	4.13
	7/7/98		3.74	3.47
Well	10/1/98		4.63	2.58
Destroyed	12/30/98		3.90	3.31
MW-3	10/21/96	10.52	7.66	2.86
(12-17)	11/4/96		5.70	4.82
	3/4/97		11.38	-0.86
	6/12/97		5.18	5.34
	7/14/97		7.96	2.56
	9/9/97		10.16	0.36
	9/19/97		12.80	-2.28
	2/13/98		11.42	-0.90
	7/7/98		11.76	-1.24
	10/1/98		11.34	-0.82
	12/30/98		4.56	5.96
	3/21/00		10.92	-0.40
	8/30/00		5.12	5.40
	11/6/00		4.10	6.42
	2/22/01		6.60	3.92
	5/7/01		6.30	4.22
	8/22/01		5.21	5.31
Well	11/4/01		5.47	5.05
Abandoned	2/15/02		4.65	5.87

TABLE 1
Groundwater Elevations in Monitoring Wells
1107 5th Street, Oakland, California

Well ID (screen depth)	Date	Casing Elevation	Depth to Water	Groundwater Elevation
MW-3N (5-12)	5/20/02	11.67	3.91	7.76
	8/1/02		4.22	7.45
	11/11/02		4.42	7.25
MW-4 (5-20)	8/30/00	10.46	3.74	6.72
	11/6/00		3.85	6.61
	2/22/01		4.66	5.80
	5/7/01		2.66	7.80
	8/22/01		4.13	6.33
	11/4/01		4.53	5.93
	2/15/02		3.62	6.84
	5/20/02		3.65	6.81
	8/1/02		4.25	6.21
	11/11/02		4.85	5.61
MW-5 (5-20)	8/30/00	10.24	3.01	7.23
	11/6/00		3.35	6.89
	2/22/01		3.00	7.24
	5/7/01		2.73	7.51
	8/22/01		3.88	6.36
	11/4/01		3.95	6.29
	2/15/02		2.84	7.40
	5/20/02		2.86	7.38
	8/1/02		3.21	7.03
	11/11/02		4.04	6.20
MW-6 (5-20)	8/30/00	10.62	3.40	7.22
	11/6/00		3.72	6.90
	2/22/01		3.34	7.28
	5/7/01		3.08	7.54
	8/22/01		3.77	6.85
	11/4/01		4.33	6.29
	2/15/02		3.22	7.40
	5/20/02		3.24	7.38
	8/1/02		3.60	7.02
	11/11/02		4.41	6.21
MW-7 (5-20)	8/30/00	11.69	6.72	4.97
	11/6/00		6.85	4.84
	2/22/01		6.00	5.69
	5/7/01		6.35	5.34
	8/22/01		6.86	4.83
	11/4/01		6.66	5.03
	2/15/02		6.45	5.24
	5/20/02		6.59	5.10
	8/1/02		6.72	4.97
	11/11/02		6.61	5.08

TABLE 1
Groundwater Elevations in Monitoring Wells
1107 5th Street, Oakland, California

Well ID (screen depth)	Date	Casing Elevation	Depth to Water	Groundwater Elevation
MW-8 (5-20)	8/30/00	10.06	3.06	7.00
	11/6/00		2.98	7.08
	2/22/01		2.46	7.60
	5/7/01		2.76	7.30
	8/22/01		3.56	6.50
	11/4/01		3.76	6.30
	2/15/02		2.72	7.34
	5/20/02		2.82	7.24
	8/1/02		3.06	7.00
	11/11/02		3.54	6.52
MW-9 (5-20)	8/30/00	10.03	2.81	7.22
	11/6/00		2.68	7.35
	2/22/01		2.20	7.83
	5/7/01		2.75	7.28
	8/22/01		3.80	6.23
	11/4/01		3.61	6.42
	2/15/02		2.92	7.11
	5/20/02		2.38	7.65
	8/1/02		2.72	7.31
	11/11/02		2.87	7.16
MW-10 (5-12)	5/20/02	11.07	4.54	6.53
	6/18/02		4.25	6.82
	8/1/02		1.80	9.27
	11/11/02		1.50	9.57
MW-11 (5-12)	5/20/02	9.64	0.84	8.80
	6/18/02		1.71	7.93
	8/1/02		4.88	4.76
	11/11/02		5.18	4.46

Notes:
All measurements are in feet. Depth to water measurements are from top of casing.
Casing and groundwater elevations are based on USGS "Port 1" benchmark (elevation 9.39 ft NGVD88).

TABLE 2
Dissolved Oxygen Concentrations in Monitoring Wells
1107 5th Street, Oakland, California

Well ID	Date	Concentration (mg/L)	Temperature (C)	Dissolved Oxygen % Saturation
MW-1	08/30/00	0.27	24.2	3.2%
	11/06/00	0.24	21.8	2.7%
	02/22/01	0.76	15.7	7.6%
	05/07/01	0.79	20.3	8.6%
	08/27/01	0.20	23.9	2.4%
	11/04/01	0.60	22.5	6.9%
	02/15/02	0.32	17.8	3.3%
	05/20/02	0.42	18.9	4.5%
	08/01/02	0.44	20.4	4.8%
	11/11/02	0.51	21.8	5.8%
MW-3	08/30/00	0.35	26.4	4.4%
	11/06/00	0.23	22.7	2.6%
	02/22/01	0.97	15.3	9.6%
	05/07/01	NM	NM	NM
	08/27/01	0.40	23.9	4.7%
Well	11/04/01	NM	NM	NM
Abandoned	02/15/02	0.37	18.7	3.9%
MW-3N	05/20/02	0.51	20.6	5.6%
	08/01/02	0.36	22.7	4.1%
	11/11/02	0.27	22.6	3.1%
MW-4	08/30/00	0.16	27.4	2.0%
	11/06/00	0.30	23.9	3.5%
	02/22/01	0.85	16.3	8.6%
	05/07/01	0.95	20.5	10.4%
	08/27/01	0.20	26.1	2.5%
	11/04/01	0.30	23.7	3.5%
	02/15/02	0.18	17.0	1.8%
	05/20/02	0.21	20.0	2.3%
	08/01/02	0.26	23.6	3.1%
	11/11/02	0.27	22.4	3.1%
MW-5	8/30/00	0.28	27.0	3.6%
	11/6/00	0.24	22.6	2.8%
	2/22/01	0.77	14.7	7.5%
	5/7/01	0.99	19.8	10.7%
	8/27/01	0.20	26.4	2.5%
	11/4/01	0.60	23.1	7.0%
	2/15/02	0.27	16.9	2.8%
	5/20/02	0.22	18.7	2.3%
	08/01/02	0.30	20.8	3.3%
	11/11/02	0.27	21.4	3.0%
MW-6	8/30/00	0.42	27.7	5.4%
	11/6/00	0.23	23.0	2.7%
	2/22/01	1.01	15.3	10.0%
	5/7/01	0.89	21.0	9.9%
	8/27/01	0.15	26.5	1.9%
	11/4/01	0.50	23.0	5.8%
	2/15/02	0.23	18.3	2.4%

TABLE 2
Dissolved Oxygen Concentrations in Monitoring Wells
1107 5th Street, Oakland, California

Well ID	Date	Concentration (mg/L)	Temperature (C)	Dissolved Oxygen % Saturation
MW-6 Continued	5/20/02	0.25	22.5	2.9%
	08/01/02	0.29	21.1	3.2%
	11/11/02	0.26	21.3	2.9%
MW-7	8/30/00	0.17	26.8	2.1%
	11/6/00	0.25	23.5	2.9%
	2/22/01	0.66	17.1	6.8%
	5/7/01	0.56	21.0	6.2%
	8/27/01	0.40	25.4	4.9%
	11/4/01	0.42	24.0	5.0%
	2/15/02	0.18	18.3	1.9%
	5/20/02	0.42	20.2	4.6%
	08/01/02	0.24	22.4	2.7%
	11/11/02	0.25	21.7	2.8%
MW-8	8/30/00	0.18	26.4	2.3%
	11/6/00	0.25	23.7	2.9%
	2/22/01	0.69	17.1	7.1%
	5/7/01	0.96	21.1	10.7%
	8/27/01	0.15	26.1	1.9%
	11/4/01	0.30	24.2	3.6%
	2/15/02	0.25	17.0	2.6%
	5/20/02	0.24	20.0	2.6%
	08/01/02	0.21	22.7	2.4%
	11/11/02	0.28	22.8	3.2%
MW-9	8/30/00	0.30	22.8	3.5%
	11/6/00	0.31	21.7	3.5%
	2/22/01	0.71	16.2	7.2%
	5/7/01	0.97	18.8	10.3%
	8/27/01	0.20	23.0	2.3%
	11/4/01	0.30	22.1	3.4%
	2/15/02	0.22	17.6	2.3%
	5/20/02	0.25	18.7	2.6%
	08/01/02	0.30	21.2	3.3%
	11/11/02	0.34	22.1	3.9%
MW-10	5/20/02	0.21	16.7	2.1%
	08/01/02	0.35	20.0	3.8%
	11/11/02	0.29	18.7	3.1%
MW-11	5/20/02	0.22	19.6	2.4%
	8/1/02	0.13	22.4	1.5%
	11/11/02	0.26	22.3	3.0%

Notes:
All measurements were made in the field. NM, not measured.
% Saturation = C/(-0.1883*T+12.9667), where C is the concentration and T is temperature.

TABLE 3
Groundwater Analytical Results
1107 5th Street, Oakland, California

Well ID	Date	TPH-d	TPH-g	Benzene	Toluene	Ethyl-benzene	Xylenes	MtBE (8021)	MtBE (8260)	DIPE	EtBE	tAME	tBA	Methanol	Ethanol	EDB	DCA
MW-1	11/4/96	220	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/5/97	230	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/12/97	290	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/9/97	180	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2/13/98	590	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7/7/98	1,400	ND	ND	ND	ND	ND	NA	2.7	NA	NA	NA	NA	NA	NA	NA	NA
	10/1/98	1,100	ND	ND	ND	ND	ND	NA	1.8	NA	NA	NA	NA	NA	NA	NA	NA
	12/30/98	1,700	ND	ND	ND	ND	ND	NA	2.3	NA	NA	NA	NA	NA	NA	NA	NA
	3/21/00	3,100	220	11	ND	ND	ND	NA	4,800	NA	NA	NA	NA	NA	NA	NA	NA
	8/30/00	1,600	140	5.3	<0.5	<0.5	<0.5	2,900	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11/6/00	1,500	51	1.0	<0.5	<0.5	<0.5	1,700	2,100	<50	<50	<50	<250	NA	NA	<50	<50
	2/22/01	3,000	140	<0.5	<0.5	<0.5	<0.5	1,000	1,100	<20	<20	<20	<100	<4,000	<1,000	<20	<20
	5/7/01	3,800	<50	<0.5	<0.5	<0.5	<0.5	780	1,100	<20	<20	<20	<100	<10,000	<1,000	<20	<20
	8/22/01	1,800	<110	<0.5	<0.5	<0.5	<0.5	1,900	1,600	<25	<25	<25	<130	NA	NA	<25	<25
	11/4/01	1,300	<50	<0.5	<0.5	<0.5	<0.5	1600	1,500	<50	<50	<50	<250	NA	NA	<50	<50
	2/15/02	2,000	<50	<0.5	<0.5	<0.5	<0.5	610	770	<20	<20	<20	<100	<10,000	<1,000	<20	<20
	5/20/02	160	<50	<0.5	<0.5	<0.5	<0.5	570	730	<10	<10	<10	<100	<10,000	<1,000	<10	<10
	8/1/02	600	<50	<0.5	<0.5	<0.5	<0.5	480	610	<10	<10	<10	<100	<10,000	<1,000	<10	<10
	11/11/02	2,200	<50	<0.5	<0.5	<0.5	<0.5	510	600	<10	<10	<10	<100	<10,000	<1,000	<10	<10
MW-2	11/4/96	2,700	910	120	23	3.5	51	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/5/97	2,300	4,400	1,500	51	24	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/12/97	2,400	3,600	1,200	14	12	40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/9/97	970	3,700	570	31	19	60	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2/13/98	2,200	6,500	2,400	31	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7/7/98	2,700	5,200	2,800	ND	ND	ND	NA	1,000,000	NA	NA	NA	NA	NA	NA	NA	NA
Well	10/1/98	1,200	1,200	330	12	8.8	11	NA	360,000	NA	NA	NA	NA	NA	NA	NA	NA
Destroyed	12/30/98	1,900	1,000	96	ND	ND	ND	NA	360,000	NA	NA	NA	NA	NA	NA	NA	NA
MW-3	11/4/96	310	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/5/97	210	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/12/97	94	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/9/97	2,300	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2/13/98	570	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7/7/98	1,100	ND	ND	ND	ND	ND	NA	6.6	NA	NA	NA	NA	NA	NA	NA	NA
	10/1/98	390	ND	ND	ND	ND	ND	NA	4.8	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 3
Groundwater Analytical Results
1107 5th Street, Oakland, California

Well ID	Date	TPH-d	TPH-g	Benzene	Toluene	Ethyl-benzene	Xylenes	MtBE (8021)	MtBE (8260)	DIPE	EtBE	tAME	tBA	Methanol	Ethanol	EDB	DCA
MW-3	12/30/98	64	ND	ND	ND	ND	ND	NA	4.5	NA	NA	NA	NA	NA	NA	NA	NA
Continued	3/21/00	2,800	ND	ND	ND	ND	ND	NA	4.8	NA	NA	NA	NA	NA	NA	NA	NA
	8/30/00	260	<50	1.3	<0.5	<0.5	<0.5	12	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11/6/00	940	<50	<0.5	<0.5	<0.5	<0.5	25	12	<1	<1	<1	<5	NA	NA	<1	<1
	2/22/01	340	<50	1.2	1.5	<0.5	0.74	18	26	<1	<1	<1	<5	<200	<50	<1	<1
	5/7/01	460	140	0.76	4.7	2.2	14	25	33	<1	<1	<1	<5	<200	<50	<1	<1
	8/22/01	130	<50	<0.5	<0.5	<0.5	<0.5	41	44	<1	<1	<1	<5	NA	NA	<1	<1
Well	11/4/01	190	<50	<0.5	<0.5	<0.5	<0.5	36	43	<1	<1	<1	<5	NA	NA	<1	<1
Abandoned	2/15/02	780	<50	<0.5	<0.5	<0.5	<0.5	38	45	<1	<1	<1	<5	<500	<50	<1	<1
MW-3N	5/20/02	1,800	<50	<0.5	<0.5	<0.5	<0.5	1,100	1,500	<25	<25	<25	<250	<25,000	<2,500	<25	<25
	8/1/02	2,900	<50	<0.5	<0.5	<0.5	<0.5	350	540	<10	<10	14	<100	<10,000	<1,000	<10	<10
	11/11/02	1,100	<50	<0.5	<0.5	<0.5	<0.5	280	270	<5	<5	7.1	<50	<5000	<500	<5	<5
MW-4	8/30/00	390	1,300	64	63	9.7	110	210,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11/6/00	170	<3,300	80	<4	<5	<3	130,000	120,000	<2,500	<2,500	<2,500	<13,000	NA	NA	<2,500	<2,500
	11/6/00*	NA	<3,300	86	<4	<7	<6	130,000	120,000	<2,500	<2,500	<2,500	<13,000	NA	NA	<2,500	<2,500
	2/22/01	120	<3,300	30	<3	<3	<3	120,000	150,000	<2,500	<2,500	<2,500	<13,000	<500,000	<130,000	<2,500	<2,500
	5/7/01	240	<4,200	<20	<10	<5	<5	150,000	200,000	<5,000	<5,000	<5,000	<25,000	<2,500,000	<250,000	<5,000	<5,000
	8/22/01	300	<5,400	<5	<5	<5	<5	160,000	190,000	<5,000	<5,000	<5,000	<25,000	NA	NA	<5,000	<5,000
	11/4/01	210	<5,000	<5	<5	<5	<5	130,000	170,000	<2,500	<2,500	<2,500	<13,000	NA	NA	<2,500	<2,500
	2/15/02	340	<5,000	<5	<5	<5	<10	160,000	160,000	<2,500	<2,500	<2,500	<12,500	<1,250,000	<125,000	<2,500	<2,500
	5/20/02	200	<2,500	<25	<25	<25	<25	98,000	130,000	<1,700	<1,700	<1,700	<17,000	<2,500,000	<170,000	<1,700	<1,700
	8/1/02	200	<2,500	<25	<25	<25	<25	89,000	100,000	<1,700	<1,700	<1,700	<17,000	<1,700,000	<170,000	<1,700	<1,700
	11/11/02	200	<3,000	<25	<25	<25	<25	99,000	84,000	<1,700	<1,700	<1,700	<17,000	<1,700,000	<170,000	<1,700	<1,700
MW-5	8/30/00	450	1,000	<5	<5	<5	<5	52,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11/6/00	520	<1,000	<1	<1	<1	<1	44,000	42,000	<1,000	<1,000	<1,000	<5,000	NA	NA	<1,000	<1,000
	2/22/01	270	<1,000	<1	<1	<1	<1	30,000	39,000	<500	<500	<500	<2,500	<100,000	<25,000	<500	<500
	5/7/01	470	<1,800	<5	<2	<2	<2	48,000	59,000	<1,000	<1,000	<1,000	<5,000	<500,000	<50,000	<1,000	<1,000
	8/22/01	780	<2,200	<3	<3	<3	<3	63,000	70,000	<1,000	<1,000	<1,000	<5,000	NA	NA	<1,000	<1,000
	11/4/01	670	<1,700	<2	<2	<2	<2	44,000	37,000	<1,000	<1,000	<1,000	<5,000	NA	NA	<1,000	<1,000
	2/15/02	480	<1,100	<1	<1	<1	<1	33,000	33,000	<1,250	<1,250	<1,250	<6,250	<625,000	<62,500	<1,250	<1,250
	5/20/02	1,600	<500	<5	<5	<5	<5	21,000	28,000	<500	<500	<500	<5,000	<500,000	<50,000	<500	<500
	8/1/02	810	<500	<5	<5	<5	<5	21,000	24,000	<500	<500	<500	<5,000	<500,000	<50,000	<500	<500
	11/11/02	2,100	<500	<5	<5	<5	<5	10,000	8,800	<200	<200	<200	10,000	<200,000	<20,000	<200	<200

TABLE 3
Groundwater Analytical Results
1107 5th Street, Oakland, California

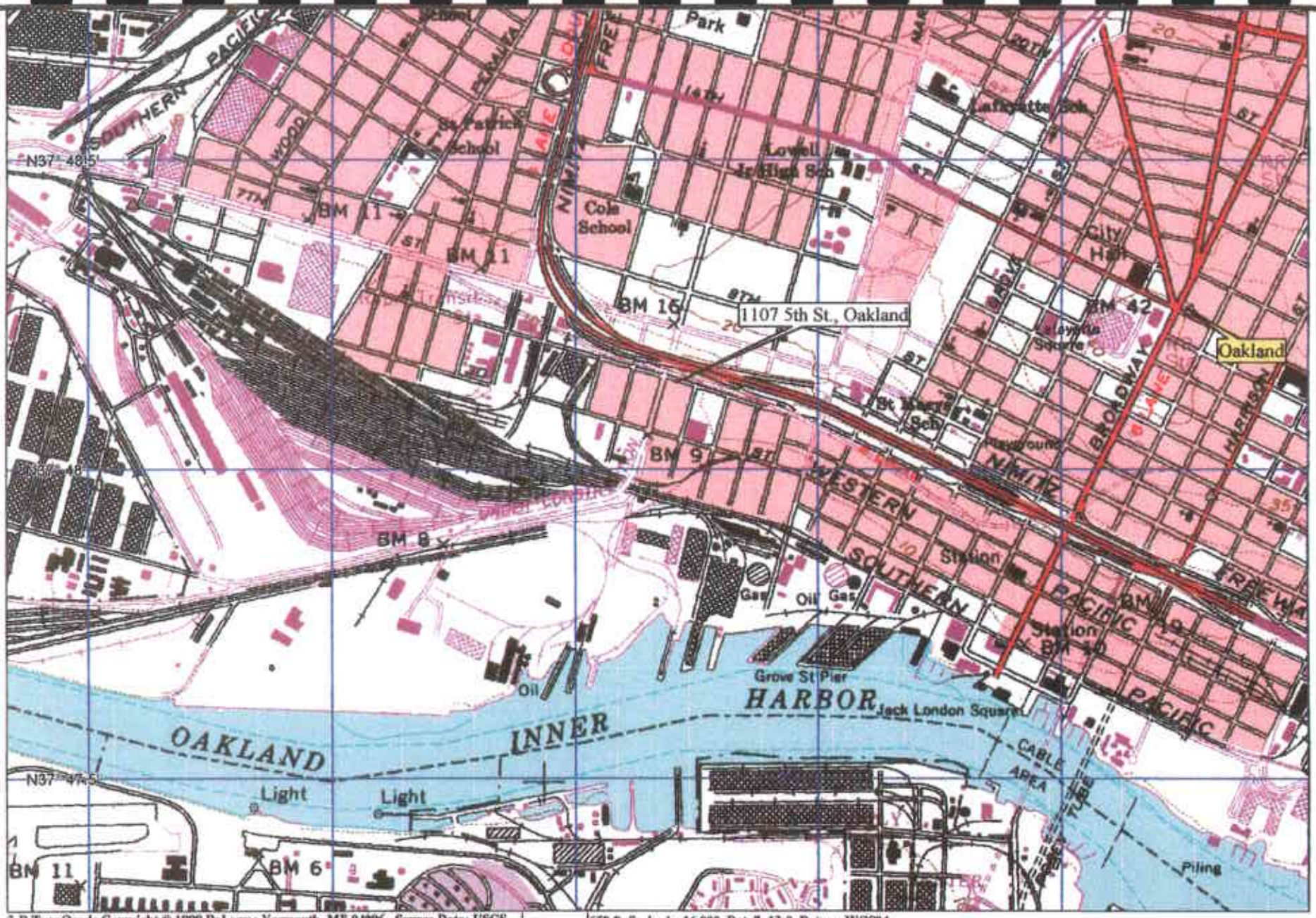
Well ID	Date	TPH-d	TPH-g	Benzene	Toluene	Ethyl-benzene	Xylenes	MtBE (8021)	MtBE (8260)	DIPE	EtBE	tAME	tBA	Methanol	Ethanol	EDB	DCA
MW-6	8/30/00	1,300	1,300	55	<0.5	16	27	23,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11/6/00	1,100	<630	7	8.1	<3	5.2	26,000	27,000	<630	<630	<630	<3,200	NA	NA	<630	<630
	2/22/01	420	<200	<5	<5	<5	<5	6,500	8,000	<100	<100	<100	<500	<20,000	<5,000	<100	<100
	5/7/01	900	<1,000	<2	<2	<1	<1	37,000	40,000	<500	<500	<500	<2,500	<250,000	<25,000	<500	<500
	8/22/01	520	<350	<2	<1	<0.5	<0.5	8,600	8,800	<200	<200	<200	<1,000	NA	NA	<200	<200
	11/4/01	420	<500	<2	<2	<0.5	<0.5	12,000	17,000	<250	<250	<250	<1,300	NA	NA	<250	<250
	2/15/02	910	<960	2.6	4.5	<1	4.2	23,000	26,000	<1,000	<1,000	<1,000	<5,000	<500,000	<50,000	<1,000	<1,000
	5/20/02	690	<620	<6.2	<6.2	<6.2	<6.2	25,000	37,000	<500	<500	<500	<5,000	<500,000	<50,000	<500	<500
	8/1/02	1,100	<250	8.0	<2.5	<2.5	<2.5	8,100	9,100	<170	<170	<170	3800	<170,000	<17,000	<170	<170
	11/11/02	1,000	<500	<5	<5	<5	<5	11,000	11,000	<250	<250	<250	8600	<250,000	<25,000	<250	<250
MW-7	8/30/00	2,600	160,000	28,000	15,000	1,200	5,900	800,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11/6/00	1,700	80,000	23,000	12,000	1,200	5,000	540,000	920,000	<13,000	<13,000	<13,000	<63,000	NA	NA	<13,000	<13,000
	2/22/01	2,000	80,000	19,000	12,000	1,100	3,200	440,000	460,000	<5,000	<5,000	<5,000	<2,500	<1,000,000	<250,000	<5,000	<5,000
	2/22/01*	2,400	84,000	20,000	13,000	1,200	3,400	400,000	500,000	<5,000	<5,000	<5,000	<25,000	<1,000,000	<250,000	<5,000	<5,000
	5/7/01	7,600	100,000	25,000	16,000	1,700	6,600	460,000	520,000	<5,000	<5,000	<5,000	<2,500	<2,500,000	<250,000	<5,000	<5,000
	5/7/01*	8,200	100,000	25,000	17,000	1,700	6,700	530,000	500,000	<5,000	<5,000	<5,000	<25,000	<2,500,000	<5,000	<5,000	<5,000
	8/22/01	22,000	110,000	18,000	12,000	2,000	9,400	240,000	250,000	<5,000	<5,000	<5,000	<25,000	NA	NA	<5,000	<5,000
	11/4/01	6,500	85,000	17,000	2,700	2,100	9,700	150,000	180,000	<2,500	<2,500	<2,500	<13,000	NA	NA	<2,500	<2,500
	2/15/02	21,000	96,000	21,000	7,300	2,600	13,000	180,000	200,000	<5,000	<5,000	<5,000	<25,000	<2,500,000	<250,000	<5,000	<5,000
	2/15/02*	29,000	160,000	30,000	27,000	3,700	19,000	170,000	200,000	<5,000	<5,000	<5,000	<25,000	<2,500,000	<250,000	<5,000	<5,000
	5/20/02	310,000	140,000	24,000	21,000	3,800	20,000	180,000	220,000	<5,000	<5,000	<5,000	<50,000	<5,000,000	<500,000	<5,000	<5,000
	8/1/02	160,000	110,000	15,000	16,000	4,000	21,000	120,000	150,000	<2,500	<2,500	<2,500	<25,000	<2,500,000	<250,000	<2,500	<2,500
	11/11/02	240,000	110,000	14,000	11,000	4,100	19,000	74,000	77,000	<1,200	<1,200	<1,200	<12,000	<1,200,000	<120,000	<1,200	<1,200
MW-8	8/30/00	690	<1,000	18	<1	<1	<1	28,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11/6/00	810	<3,300	<8	<5	<3	<7	120,000	76,000	<2,500	<2,500	<2,500	<13,000	NA	NA	<2,500	<2,500
	2/22/01	1,100	<2,500	53	<3	<3	<3	99,000	130,000	<2,000	<2,000	<2,000	<10,000	<400,000	<100,000	<2,000	<2,000
	5/7/01	1,300	<5,000	32	<10	<5	<5	110,000	120,000	<2,500	<2,500	<2,500	<13,000	<1,300,000	<13,000	<2,500	<2,500
	8/22/01	1,200	<4,000	<5	<5	<5	16	76,000	86,000	<1,700	<1,700	<1,700	<8,500	NA	NA	<1,700	<1,700
	11/4/01	1,100	590	6.9	<0.5	<0.5	<0.5	60,000	49,000	<2,500	<2,500	<2,500	<13,000	NA	NA	<2,500	<2,500
	2/15/02	1,500	<3,400	<5	<5	<5	<5	110,000	91,000	<2,500	<2,500	<2,500	<12,500	<1,250,000	<125,000	<2,500	<2,500
	5/20/02	2,200	<1,700	<17	<17	<17	<17	66,000	86,000	<1,000	<1,000	<1,000	<10,000	<1,000,000	<100,000	<1,000	<1,000
	8/1/02	2,800	<1,200	<12	<12	<12	<12	53,000	67,000	<1,000	<1,000	<1,000	<10,000	<1,000,000	<100,000	<1,000	<1,000
	11/11/02	11,000	<2,000	<10	18	<10	<10	48,000	51,000	<1,000	<1,000	<1,000	<10,000	<1,000,000	<100,000	<1,000	<1,000

TABLE 3
Groundwater Analytical Results
1107 5th Street, Oakland, California

Well ID	Date	TPH-d	TPH-g	Benzene	Toluene	Ethyl-benzene	Xylenes	MtBE (8021)	MtBE (8260)	DIPE	EtBE	tAME	tBA	Methanol	Ethanol	EDB	DCA
MW-9	8/30/00	770	<50	<0.5	<0.5	<0.5	<0.5	97	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11/6/00	390	<50	<0.5	<0.5	<0.5	<0.5	190	220	<25	<25	<25	<125	NA	NA	<5	<5
	2/22/01	240	<50	<0.5	<0.5	<0.5	<0.5	120	160	<2	<2	<2	<1	<400	<100	<2	<2
	5/7/01	190	<50	<0.5	<0.5	<0.5	<0.5	120	150	<2.5	<2.5	<2.5	<13	<1300	<130	<2.5	<2.5
	8/22/01	120	<50	<0.5	<0.5	<0.5	<0.5	120	120	<5	<5	<5	<25	NA	NA	<5	<5
	11/4/01	160	<50	<0.5	<0.5	<0.5	<0.5	130	120	<5	<5	<5	<25	NA	NA	<5	<5
	2/15/02	150	<50	<0.5	<0.5	<0.5	<0.5	92	98	<2.5	<2.5	<2.5	<12.5	<1,250	<125	<2.5	<2.5
	5/20/02	380	<50	<0.5	<0.5	<0.5	<0.5	79	85	<2.5	<2.5	<2.5	<25	<2,500	<250	<2.5	<2.5
	8/1/02	320	<50	<0.5	<0.5	<0.5	<0.5	74	84	<1.0	<1.0	<1.0	<10	<1,000	<100	<1.0	<1.0
	11/11/02	150	<50	<0.5	<0.5	<0.5	<0.5	76	61	<2.5	<2.5	<2.5	<25	<2,500	<250	<2.5	<2.5
MW-10	5/20/02	63	<50	1.0	<0.5	<0.5	<0.5	<5.0	1.2	<0.5	<0.5	<0.5	<5	<500	<50	<0.5	<0.5
	8/1/02	720	<50	1.0	<0.5	<0.5	<0.5	<5.0	1.1	<0.5	<0.5	<0.5	<5	<500	<50	<0.5	<0.5
	11/11/02	100	<50	0.72	<0.5	<0.5	<0.5	<5.0	0.71	<0.5	<0.5	<0.5	<5	<500	<50	<0.5	<0.5
MW-11	5/20/02	95	<50	1.5	3.0	<0.5	1.4	260	310	<5	<5	<5	<50	<5,000	<500	<5	<5
	8/1/02	190	<50	<0.5	1.9	0.6	<0.5	52	65	<1.0	<1.0	<1.0	<10	<1,000	<100	<1.0	<1.0
	11/11/02	140	<50	<0.5	2.1	1.1	<0.5	23	15	<0.5	<0.5	<0.5	<5	<500	<50	<0.5	<0.5
MCL		**NE**	**NE**	**1**	**150**	**700**	**1,750**	**13**	**13**	**NE**	**NE**	**NE**	**12****	**NE**	**NE**	**0.05**	**0.5**

Notes: Units are micrograms per liter (ug/L). ND, Not detected. NA, Not analyzed. * Duplicate Sample.
MCL, Primary Maximum Contaminant Level for Drinking Water in California. ** Denotes a Drinking Water Action Level, not an MCL.
NE, MCL or Action Level not established.
TPH-d, Total Petroleum Hydrocarbons as diesel. TPH-g, Total Petroleum Hydrocarbons as gasoline.
MtBE, Methyl tert-Butyl Ether; (8021, analyzed by Method 8021B; 8260, analyzed by Method 8260B).
DIPE, Di-isopropyl Ether. EtBE, Ethyl tert-Butyl Ether. tAME, tert-Amyl Methyl Ether. tBA, tert-Butyl Alcohol.
EDB, Ethylene Dibromide (1,2-Dibromoethane). DCA, 1,2-Dichloroethane.

FIGURES



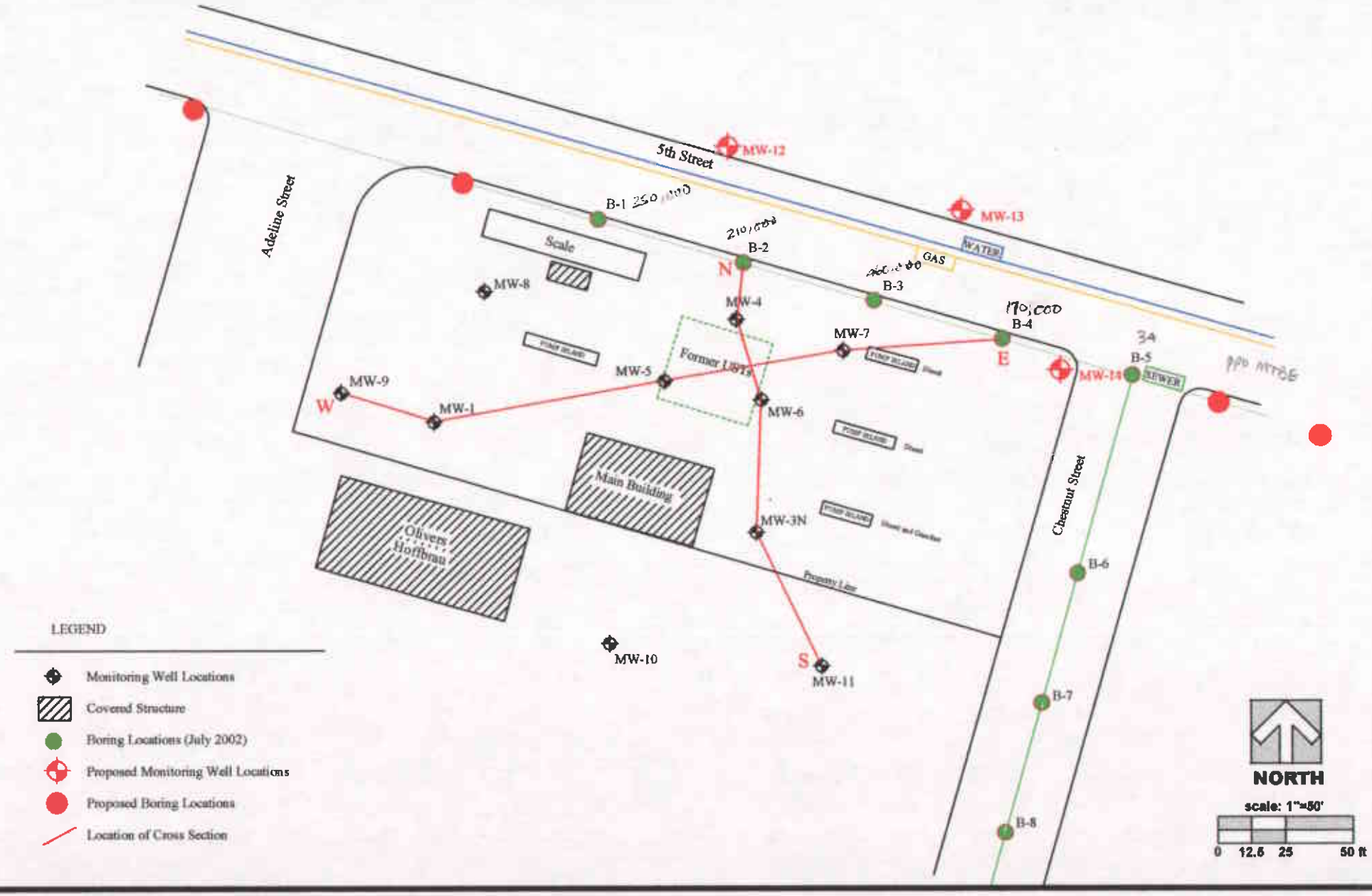
W.A. Craig, Inc.
6940 Tremont Road LIC# 455752
Dixon, California 95620-9603
PH# (707) 693-2929 Fax# (707) 693-2922

Site Location Map

Oakland Truck Stop
1107 5th Street
Oakland, California

NORTH

Project #: 3628	Figure: 1
Date: 11/11/02	
Scale: 1"=50'	



CENTRAL PROJECT FILE/ 2628 Rinehart/Qmrs/4th 2002 qmr irwp/fig2.dwg

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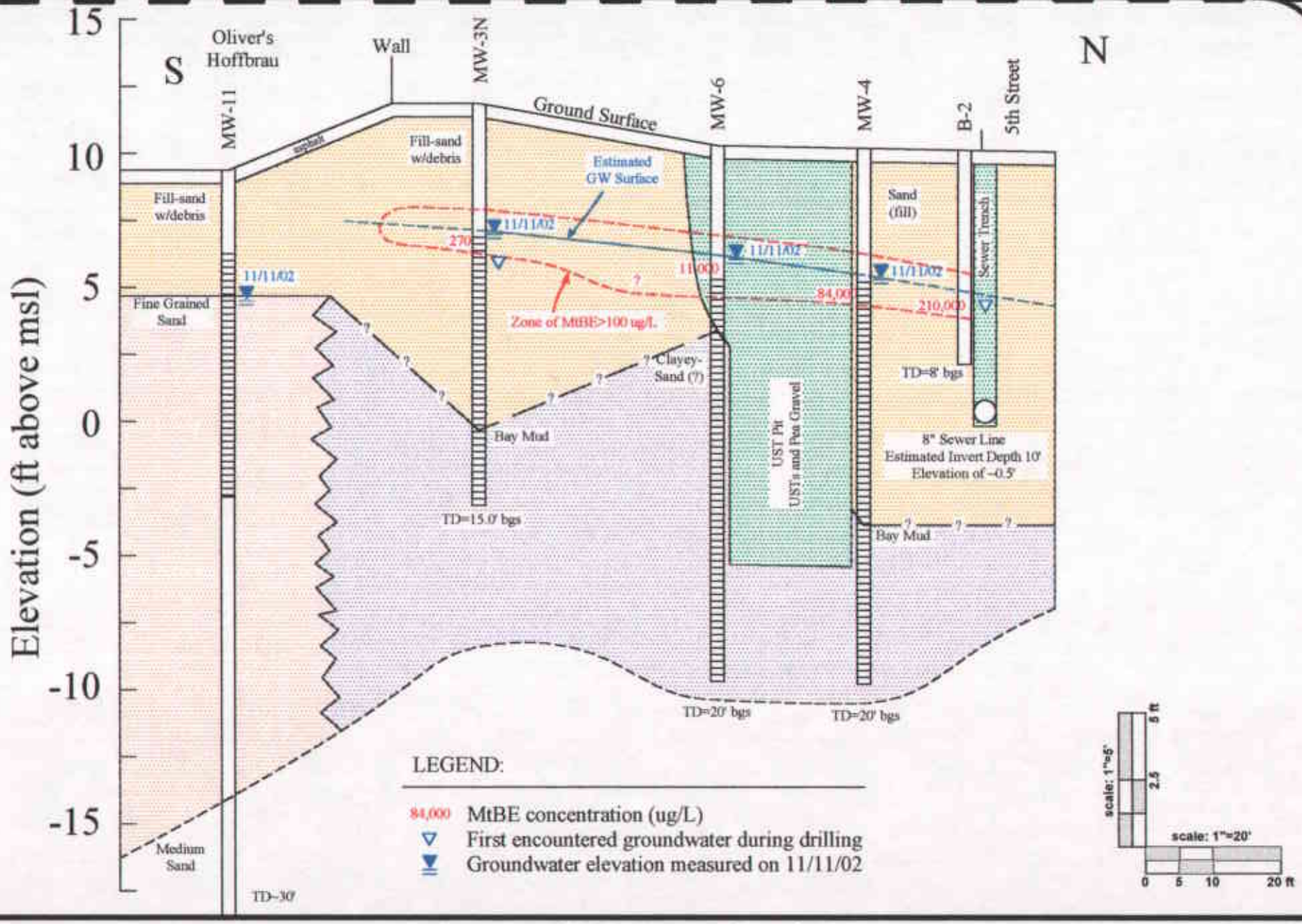
Site Plan with Proposed Sampling Locations

Oakland Truck Stop
1107 5th Street
Oakland, California

Project #: 3628	Figure: 2
Date: 11/11/02	
Scale: 1"=50'	



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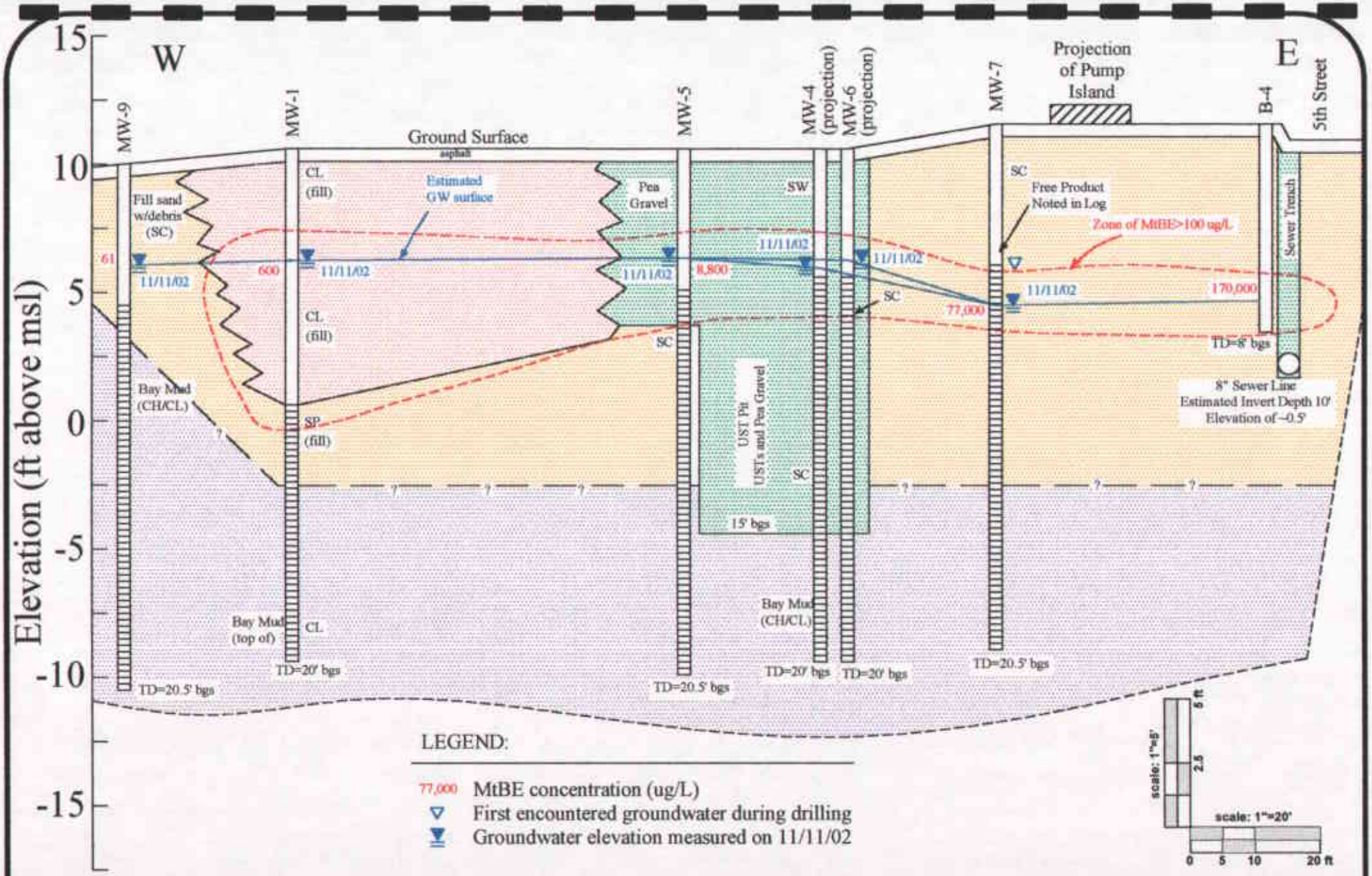
S-N Cross Section

Oakland Truck Stop
1107 5th Street
Oakland, California

Project #: 3628	Figure: 3
Date: 12/20/02	
Scale: see above	



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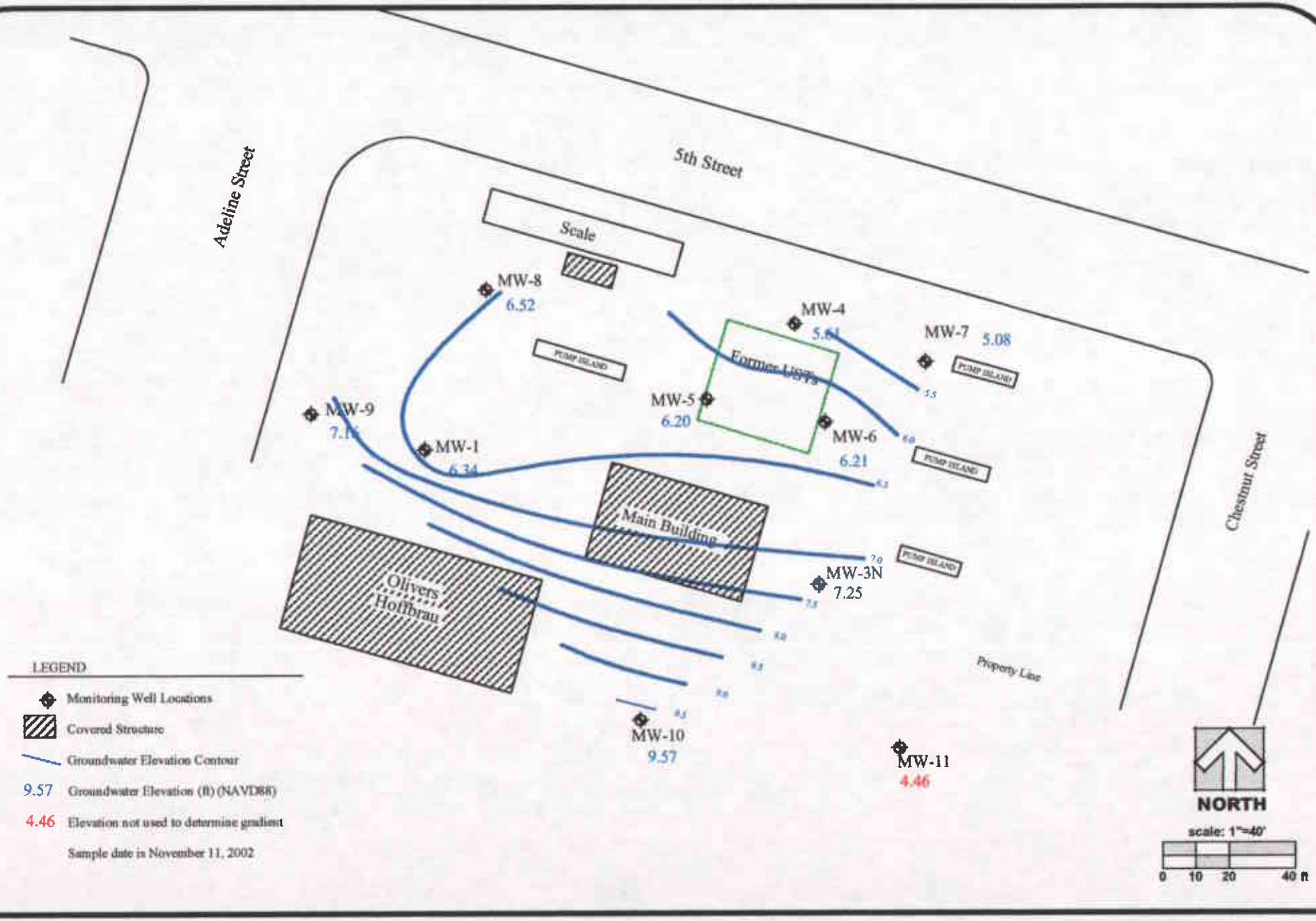
W-E Cross Section

Oakland Truck Stop
1107 5th Street
Oakland, California

Project #: 3628	Figure: 4
Date: 12/20/02	
Scale: see above	



CENTRAL PROJECT FILE/ 2628 Rinehart/Qmrs/4th 2002 qmr irwp/Figure 5 11-02.dwg

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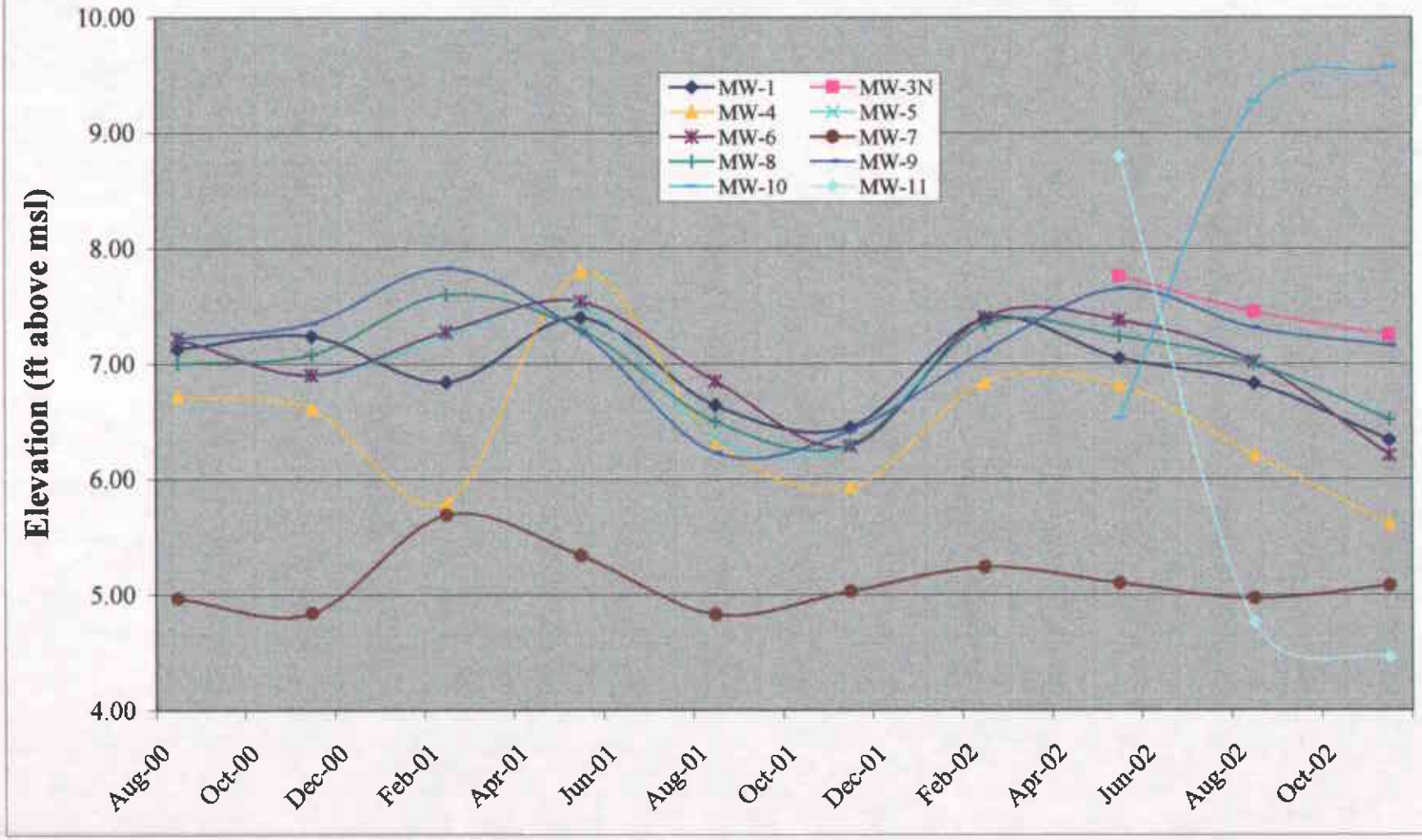
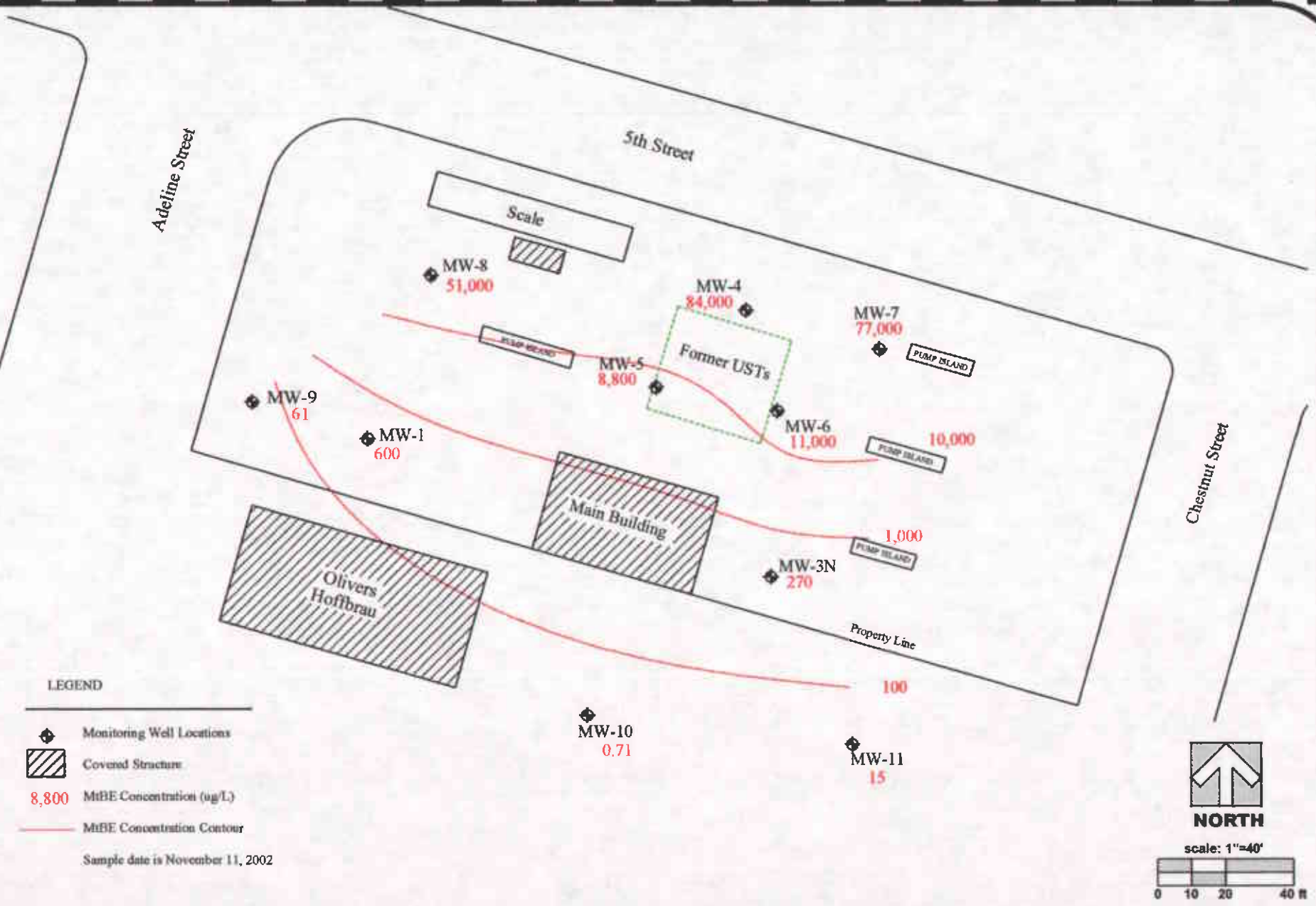
Groundwater Elevations
Oakland Truck Stop
1107 5th Street
Oakland, California

Project #: 3628	Figure: 5
Date: 11/11/02	
Scale: 1"=40'	

Figure 6
Hydrographs for Monitoring Wells
1107 5th Street, Oakland, California





CENTRAL PROJECT FILE/ 2628 Rinehart/Qmrs/4th 2002 qmr irwp/Figure 7 11-02 dwg

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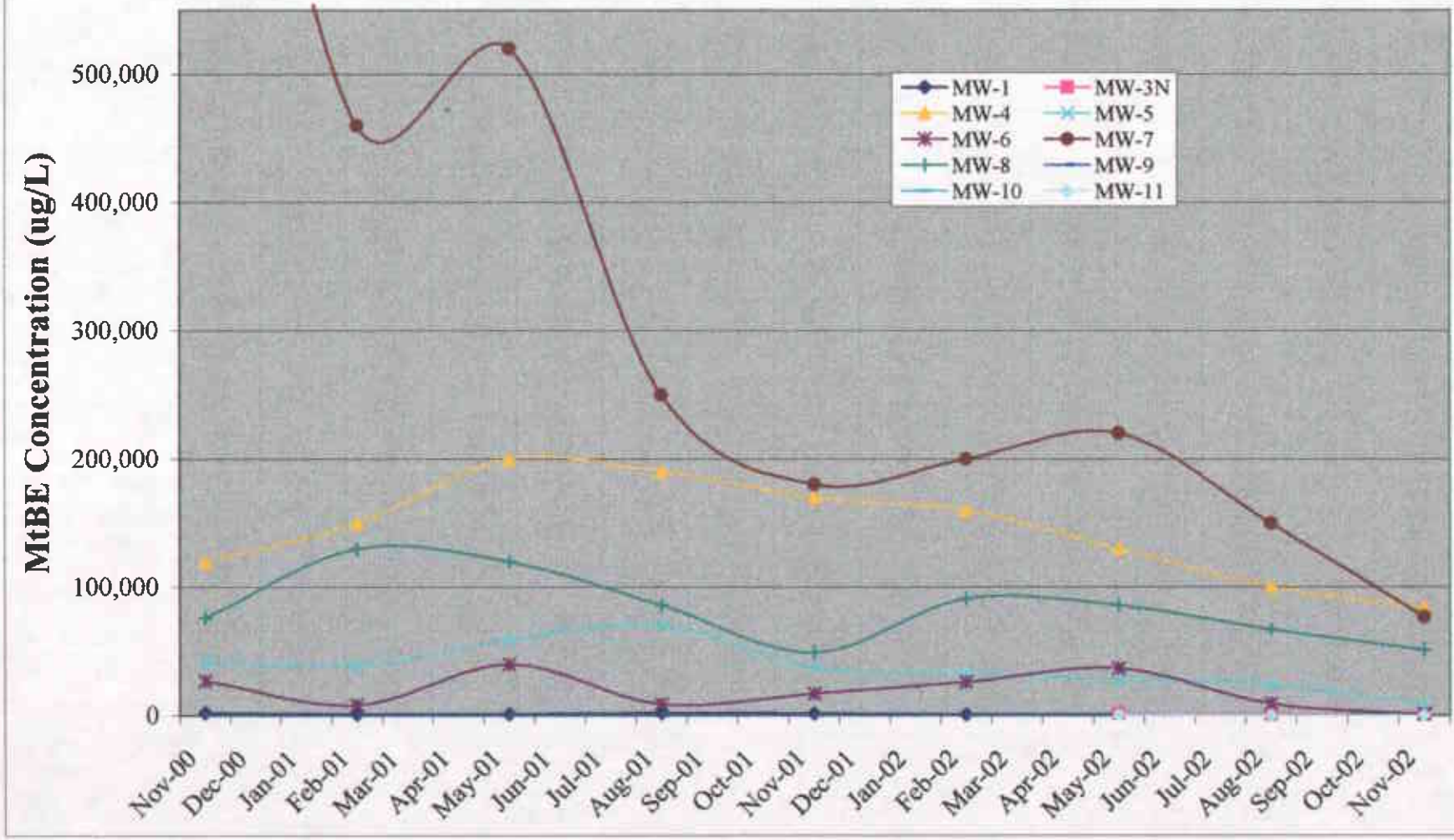
MtBE Concentrations

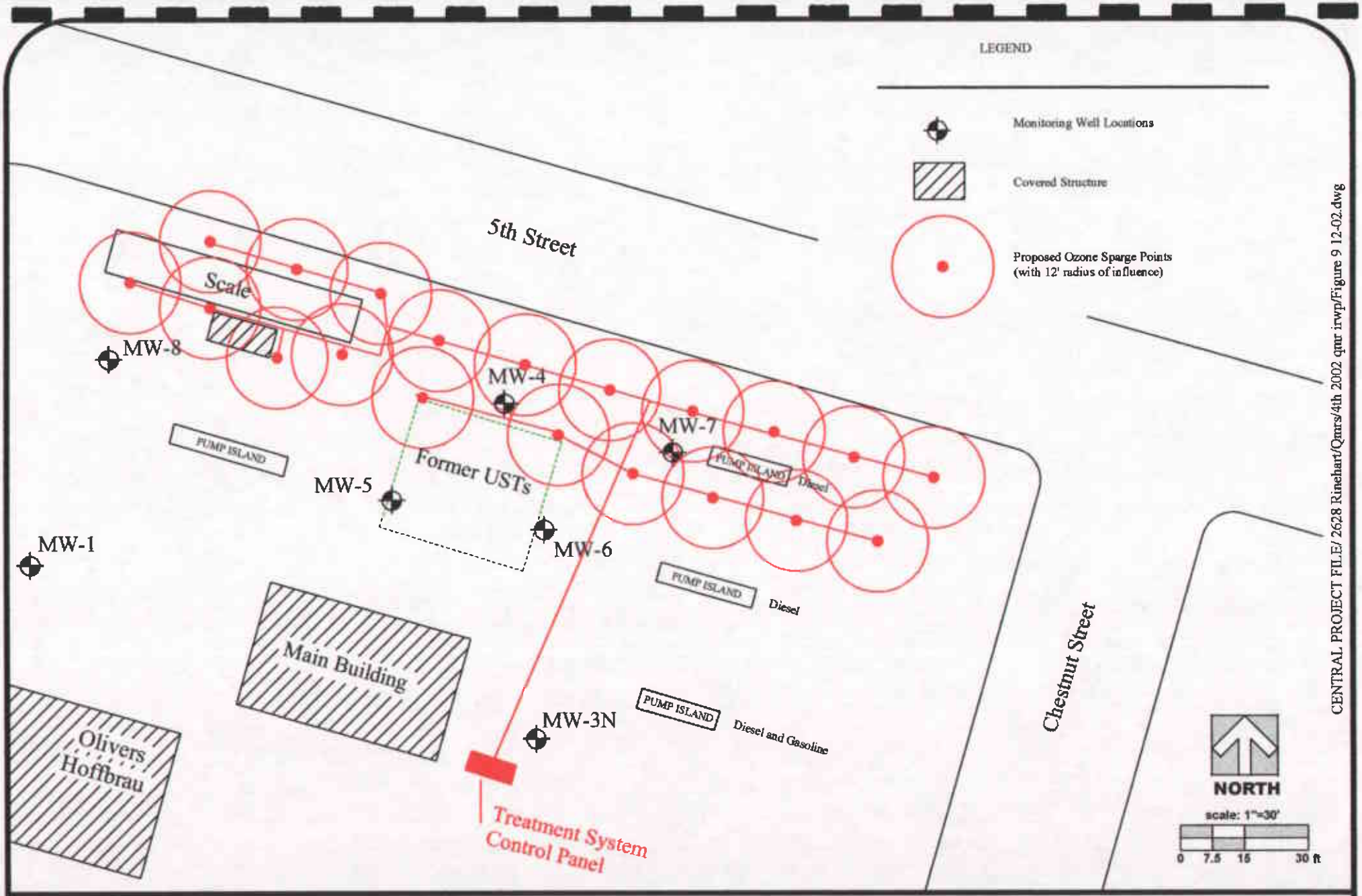
Oakland Truck Stop
1107 5th Street
Oakland, California

Project #: 3628	Figure: 7
Date: 11/11/02	
Scale: 1"=40'	

Figure 8

MtBE Concentration vs Time in Monitoring Wells
1107 5th Street, Oakland, California





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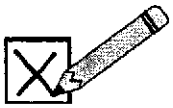
Proposed Sparging System Layout

Oakland Truck Stop
1107 5th Street
Oakland, California

Project #: 3628	Figure: 9
Date: 11/11/02	
Scale: 1"=30'	

APPENDIX A
CITY OF OAKLAND RBCA CHECKLIST AND EXPOSURE ASSESSMENT WORKSHEET

2.2 Qualifying for the Oakland RBCA Levels



The Oakland Tier 1 RBSLs and Tier 2 SSTLs are intended to address human health concerns at the majority of sites in Oakland where commonly-found contaminants are present. Complicated sites—especially those with continuing releases, ecological concerns or unusual subsurface conditions—will likely require a Tier 3 analysis. The checklist that comprises Table 1 is designed to assist you in determining your site's eligibility for the Oakland RBCA levels.[6]

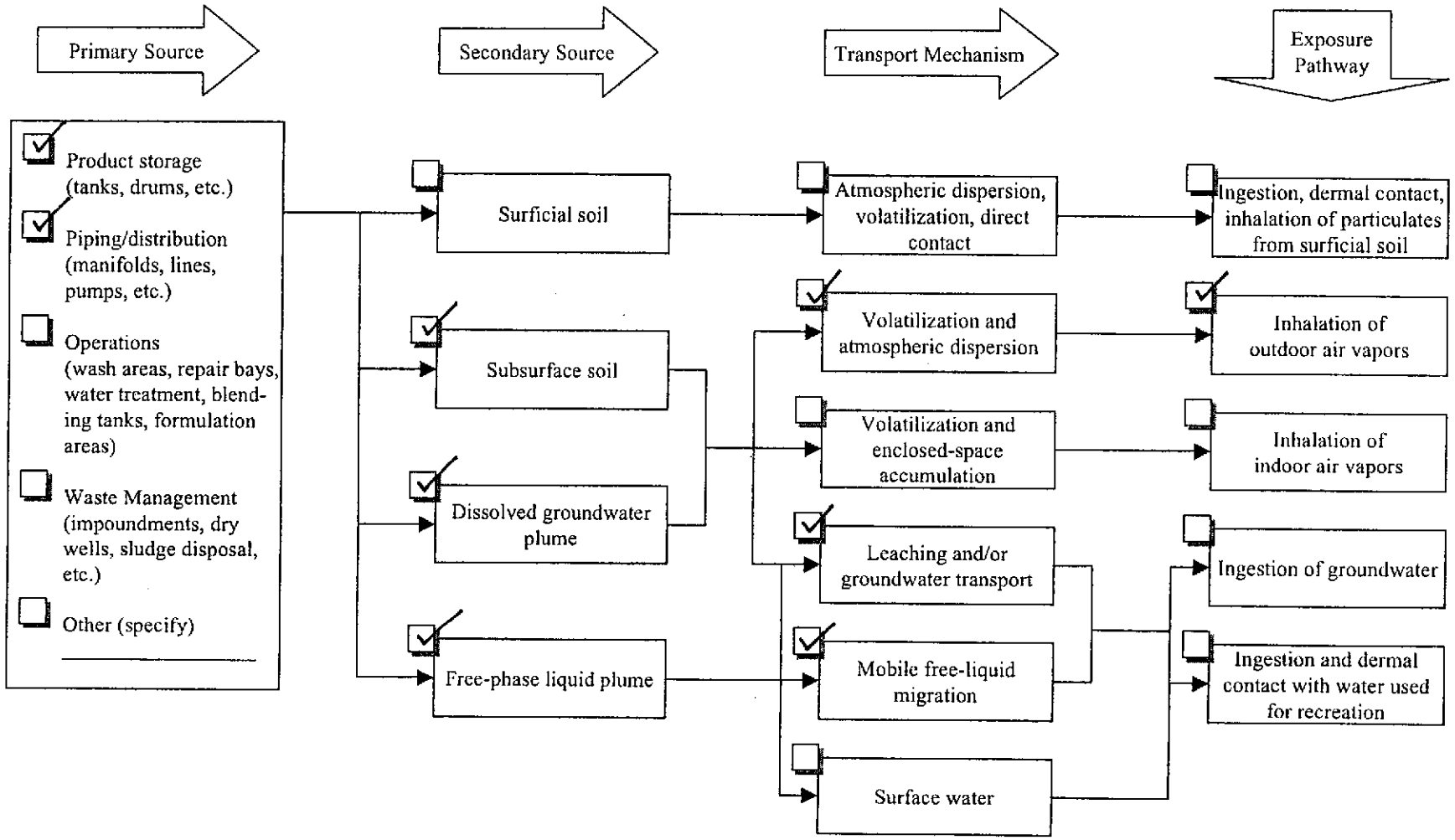
Table 1. Oakland RBCA Eligibility Checklist

CRITERIA	YES	NO
1. Is there a continuing, *primary* source of a chemical of concern, such as a leaking container, tank or pipe? (This does *not* include residual sources.)	☐	☒
2. Is there any mobile or potentially-mobile free product?	☒	☐
3. Are there more than five chemicals of concern at the site at a concentration greater than the lowest applicable Oakland RBCA level?	☐	☒
4. Is there a preferential vapor migration pathway—such as a gravel channel or a utility corridor—that is less than 1 meter from *both* of the following?		
(a) A source area containing a volatile chemical of concern		
(b) A structure where inhalation of indoor air vapors is of concern	☒	☐
5. Do *both* of the following conditions exist?		
(a) Groundwater is at depths less than 300 cm (10 feet)		
(b) Inhalation of volatilized chemicals of concern from groundwater in indoor or outdoor air is a pathway of concern but groundwater ingestion is *not**	☒	☐
6. Are there any existing on-site or off-site structures intended for future use where inhalation of indoor air vapors from either soil or groundwater is of concern *and* one or more of the following four conditions is present?		
(a) Chemicals of concern located less than one meter below the structure		
(b) A slab-on-grade foundation less than 15 cm (6 inches) thick		
(c) An enclosed, below-grade space (e.g., a basement) that has floors or walls less than 15 cm (6 inches) thick		
(d) A crawl space that is not ventilated	☐	☒
7. Are there any immediate, acute health risks to humans associated with contamination at the site, including explosive levels of a chemical?	☐	☒
8. Are there any existing or potential exposure pathways to nearby ecological receptors, such as endangered species, wildlife refuge areas, wetlands, surface water bodies or other protected areas?	☐	☒

*If groundwater ingestion *is* a pathway of concern, the associated Oakland RBCA levels will be more stringent than those for any groundwater-related inhalation scenario, rendering depth to groundwater irrelevant in the risk analysis.

If the answer to all questions is "no", your site is eligible for both the Oakland Tier 1 RBSLs and Tier 2 SSTLs. Proceed to Section 2.3 for guidance on meeting the minimum Tier 1 and Tier 2 site characterization requirements.

Figure 5. Oakland RBCA Exposure Assessment Worksheet



APPENDIX B
FIELD SAMPLING LOGS

WELL DEVELOPMENT AND SAMPLING LOG

Project Name Rino Job No. 3685 Date 11/11/03 Weather Clear/Warm

Sampler Riley

Well Data — Well Number MW-8

Total Depth of Well 20.5 Casing Elevation _____ Depth to Water 3.54 Groundwater Elevation _____

Method of Purging Well bailer Method of Sampling Well bailer

Casing Volume 2.8 Volume Factors: 2"=0.166g/ft; 4"=0.653g/ft; 6"=1.47g/ft; 8"=2.61g/ft; 12"=5.88g/ft

Depth to Water Prior to Sampling _____ Purge 8.5

Field Parameters

Time	Volume (gal)	Temperature	SP	pH	Turbidity	Comments (color/odor/sheen/product etc.)
	Begin purging well					
	3	24	673	6.87	495.7	product present
	6	24	760	6.87	295.3	Strong odor / Light Sheen
	8	24	727	6.89	209.8	" " "

Comments: After Purge D.O. .32 @ 22.2

D.O. .28 @ 22.8

Water in well box

Well Data — Well Number MW-5

Total Depth of Well 20.5 Casing Elevation _____ Depth to Water 4.04 Groundwater Elevation _____

Method of Purging Well bailer Method of Sampling Well bailer

Casing Volume 2.7 Volume Factors: 2"=0.166g/ft; 4"=0.653g/ft; 6"=1.47g/ft; 8"=2.61g/ft; 12"=5.88g/ft

Depth to Water Prior to Sampling _____ Purge 8.2

Field Parameters

Time	Volume (gal)	Temperature	SP	pH	Turbidity	Comments (color/odor/sheen/product etc.)
	Begin purging well					
	3	21.8	577	6.81	309.5	slight odor
	6	21.8	555	6.84	355.9	" "
	8	21.8	546	6.82	379.4	" "

Comments: D.O. .27 @ 21.4°C

WELL DEVELOPMENT AND SAMPLING LOG

Project Name R.N.O Job No. 3625 Date 11/10/07 Weather Clear/Warm

Sampler C. Clay

Well Data **Well Number** MW-3N

Total Depth of Well 12 Casing Elevation _____ Depth to Water 6.42 Groundwater Elevation _____

Method of Purging Well bailer Method of Sampling Well bailer

Casing Volume 1.3 Volume Factors: 2"=0.166g/ft; 4"=0.653g/ft; 6"=1.47g/ft; 8"=2.61g/ft; 12"=5.88g/ft

Depth to Water Prior to Sampling _____ ~~Purge~~ 3.5 purge

Field Parameters

Time	Volume (gal)	Temperature	SP	pH	Turbidity	Comments (color/odor/sheen/product etc.)
	Begin purging well					
	2	22.8	4136	6.61	209.5	NOS
	4	22.9	4133	6.59	317.4	"
	5	23.1	4137	6.61	395.7	"

Comments:

Slow Recharge

After Purge

D.O. .27 @ 22.6

D.O. 2.43 @ 23.4

Well Data **Well Number** MW-7

Total Depth of Well 20.5 Casing Elevation _____ Depth to Water 6.61 Groundwater Elevation _____

Method of Purging Well bailer Method of Sampling Well bailer

Casing Volume 2.3 Volume Factors: 2"=0.166g/ft; 4"=0.653g/ft; 6"=1.47g/ft; 8"=2.61g/ft; 12"=5.88g/ft

Depth to Water Prior to Sampling _____ ~~Purge~~ 7.5 purge 7 gal

Field Parameters

Time	Volume (gal)	Temperature	SP	pH	Turbidity	Comments (color/odor/sheen/product etc.)
	Begin purging well					
	3	23.1	503	6.70	415.7	strong odor/sheen
	5	22.4	503	6.69	397.3	" " / "
	8	22.3	499	6.70	435.9	" " "

Comments:

After purge .41 @ 22.0

D.O. .25 @ 21.7°C

WELL DEVELOPMENT AND SAMPLING LOG

Project Name Kino Job No. 3625 Date 11/1/02 Weather clear / warm
Sampler Clay

Well Data **Well Number** MW-9

Total Depth of Well 20.5 Casing Elevation _____ Depth to Water 2.87 Groundwater Elevation _____
Method of Purging Well bailer Method of Sampling Well bailer
Casing Volume ~3 Volume Factors: 2"=0.166g/ft; 4"=0.653g/ft; 6"=1.47g/ft; 8"=2.61g/ft; 12"=5.88g/ft
Depth to Water Prior to Sampling _____ purge 8.9

Field Parameters

Time	Volume (gal)	Temperature	SP	pH	Turbidity	Comments (color/odor/sheen/product etc.)
	Begin purging well					
	3	22.4	1179	6.65	185.7	NOS
	6	22.0	1217	6.62	207.4	NOS
10:45	8	21.8	1272	6.69	254.5	"

Comments:
After Purge Water in well box D.O. .34 @ 22.1°C
D.O. .41 @ 20.7

Well Data **Well Number** MW-1

Total Depth of Well 20.5 Casing Elevation _____ Depth to Water 9.45 Groundwater Elevation _____
Method of Purging Well bailer Method of Sampling Well bailer
Casing Volume 2.7 Volume Factors: 2"=0.166g/ft; 4"=0.653g/ft; 6"=1.47g/ft; 8"=2.61g/ft; 12"=5.88g/ft
Depth to Water Prior to Sampling _____ purge 8 gal

Field Parameters

Time	Volume (gal)	Temperature	SP	pH	Turbidity	Comments (color/odor/sheen/product etc.)
	Begin purging well					
	2	22.7	1027	6.90	224.3	NOS
	4	22.7	1060	6.91	201.4	
	6	22.0	1396	6.86	301.4	switched buckets
10:15	6	21.8	1418	6.89	284.7	

Comments:
Slow Recharge
Well under pressure
After Purge D.O. .51 @ 21.8°C
D.O. 2.18 @ 21.5

WELL DEVELOPMENT AND SAMPLING LOG

Project Name Rino Job No. 3623 Date 11/14/02 Weather Clear/warm
Sampler Clay

Well Data **Well Number** MW-4

Total Depth of Well 20.5 Casing Elevation _____ Depth to Water 4.85 Groundwater Elevation _____
Method of Purging Well bailer Method of Sampling Well bailer
Casing Volume 2.6 Volume Factors: 2"=0.166g/ft; 4"=0.653g/ft; 6"=1.47g/ft; 8"=2.61g/ft; 12"=5.88g/ft
Depth to Water Prior to Sampling _____ purge 8 gal

Field Parameters

Time	Volume (gal)	Temperature	SP	pH	Turbidity	Comments (color/odor/sheen/product etc.)
	Begin purging well					
	3	23.1	594	6.75	305.7	strong odor / no sheen
	10	22.5	700	6.71	273.3	" " "

Comments:
After Purge
.74 @ 20.9
D.O. .27 @ 22.4°c

Well Data **Well Number** MW-6

Total Depth of Well 20.5 Casing Elevation _____ Depth to Water 4.41 Groundwater Elevation _____
Method of Purging Well bailer Method of Sampling Well bail
Casing Volume 2.7 Volume Factors: 2"=0.166g/ft; 4"=0.653g/ft; 6"=1.47g/ft; 8"=2.61g/ft; 12"=5.88g/ft
Depth to Water Prior to Sampling _____ purge 8 gal

Field Parameters

Time	Volume (gal)	Temperature	SP	pH	Turbidity	Comments (color/odor/sheen/product etc.)
	Begin purging well					
	3	22.0	458	6.96	214.3	slight odor
	6	21.6	385	6.97	313.5	switched buckets
	8	21.7	397	6.97	358.2	

Comments:
After Purge
.45 @ 21.1
D.O. .26 @ 21.3°c

WELL DEVELOPMENT AND SAMPLING LOG

Project Name Rino Job No. 3618 Date 11/1/02 Weather Clear / breezy
Sampler Clay

Well Data **Well Number** MW-10

Total Depth of Well 12 Casing Elevation _____ Depth to Water 1.50 Groundwater Elevation _____
Method of Purging Well bailer Method of Sampling Well bailer
Casing Volume 1.7 Volume Factors: 2"=0.166g/ft; 4"=0.653g/ft; 6"=1.47g/ft; 8"=2.61g/ft; 12"=5.88g/ft
Depth to Water Prior to Sampling ~~purge 3 gal~~ purge 5.2

Field Parameters

Time	Volume (gal)	Temperature	SP	pH	Turbidity	Comments (color/odor/sheen/product etc.)
	Begin purging well					
11:15	2	17.5	349	7.42	109.3	NOS
	4	17.5	332	7.36	215.7	NOS
	6	17.6	330	7.31	215.7	"

Comments:
After Purge
pH 7.6 @ 18.5 D.O. .29 @ 18.7°C

Well Data **Well Number** MW-11

Total Depth of Well 12 Casing Elevation _____ Depth to Water 5.18 Groundwater Elevation _____
Method of Purging Well bailer Method of Sampling Well bailer
Casing Volume 1.13 Volume Factors: 2"=0.166g/ft; 4"=0.653g/ft; 6"=1.47g/ft; 8"=2.61g/ft; 12"=5.88g/ft
Depth to Water Prior to Sampling ~~purge 3 gal.~~ purge 3.4

Field Parameters

Time	Volume (gal)	Temperature	SP	pH	Turbidity	Comments (color/odor/sheen/product etc.)
	Begin purging well					
	2	22.1	535	6.96	8315	NOS
	4	22.2	540	7.01	215.4	

Comments:
Slow Recharge D.O. .26 @ 22.3°C

APPENDIX C
LABORATORY ANALYTICAL REPORTS FOR MONITORING WELLS

McCampbell Analytical Inc.
110 2nd Avenue South, #D7, Pacheco, CA 94553-5560
Telephone : 925-798-1620 Fax : 925-798-1622
http://www.mccampbell.com E-mail: main@mccampbell.com

W. A. Craig Inc. 6940 Tremont Road Dixon, CA 95620-9603	Client Project ID: #3628; Rinehart	Date Sampled: 11/11/02
		Date Received: 11/11/02
	Client Contact: Tim Cook	Date Reported: 11/20/02
	Client P.O.:	Date Completed: 11/20/02

WorkOrder: 0211191

November 20, 2002

Dear Tim:

Enclosed are:

1). the results of **10** analyzed samples from your **#3628; Rinehart project,**

2). a QC report for the above samples

3). a copy of the chain of custody, and

4). a bill for analytical services.

All analyses were completed satisfactorily and all QC samples were found to be within our control limits. If you have any questions please contact me. McCampbell Analytical Laboratories strives for excellence in quality, service and cost. Thank you for your business and I look forward to working with you again.

Yours truly,

Angela Rydelius, Lab Manager

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http://www.mccampbell.com E-mail: main@mccampbell.com

W. A. Craig Inc.	Client Project ID: #3628; Rinehart	Date Sampled: 11/11/02
6940 Tremont Road		Date Received: 11/11/02
Dixon, CA 95620-9603	Client Contact: Tim Cook	Date Extracted: 11/14/02-11/18/02
	Client P.O.:	Date Analyzed: 11/14/02-11/18/02

Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with BTEX and MTBE*

Extraction method: SW5030B Analytical methods: SW8021B/8015Cm Work Order: 0211191

Lab ID	Client ID	Matrix	TPH(g)	MTBE	Benzene	Toluene	Ethylbenzene	Xylenes	DF	% SS
001A	MW-1	W	ND	510	ND	ND	ND	ND	1	100
002A	MW-3N	W	ND	280	ND	ND	ND	ND	1	105
003A	MW-4	W	ND<3000,j	99,000	ND<25	ND<25	ND<25	ND<25	50	103
004A	MW-5	W	ND<500,j	10,000	ND<5.0	ND<5.0	ND<5.0	ND<5.0	10	100
005A	MW-6	W	ND<500,j	11,000	ND<5.0	ND<5.0	ND<5.0	ND<5.0	10	107
006A	MW-7	W	110,000,a,h	74,000	14,000	11,000	4100	19,000	200	---#
007A	MW-8	W	ND<2000,j,h	48,000	ND<10	18	ND<10	ND<10	20	---#
008A	MW-9	W	ND	76	ND	ND	ND	ND	1	119
009A	MW-10	W	ND	ND	0.72	ND	ND	ND	1	102
010A	MW-11	W	ND,i	23	ND	2.1	1.1	ND	1	106
Reporting Limit for DF =1; ND means not detected at or above the reporting limit		W	50	5.0	0.5	0.5	0.5	0.5	1	µg/L
		S	NA	NA	NA	NA	NA	NA	1	mg/Kg

*water and vapor samples are reported in µg/L, soil and sludge samples in mg/kg, wipe samples in µg/wipe, and TCLP extracts in µg/L.

cluttered chromatogram; sample peak coelutes with surrogate peak.

+The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified gasoline is significant; b) heavier gasoline range compounds are significant(aged gasoline?); c) lighter gasoline range compounds (the most mobile fraction) are significant; d) gasoline range compounds having broad chromatographic peaks are significant; biologically altered gasoline?; e) TPH pattern that does not appear to be derived from gasoline (stoddard solvent / mineral spirit?); f) one to a few isolated non-target peaks present; g) strongly aged gasoline or diesel range compounds are significant; h) lighter than water immiscible sheen/product is present; i) liquid sample that contains greater than ~2 vol. % sediment; j) reporting limit raised due to high MTBE content; k) TPH pattern that does not appear to be derived from gasoline (aviation gas). m) no recognizable pattern.

DHS Certification No. 1644

Edward Hamilton, Lab Director

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http://www.mccampbell.com E-mail: main@mccampbell.com

W. A. Craig Inc.	Client Project ID: #3628; Rinehart	Date Sampled: 11/11/02
6940 Tremont Road		Date Received: 11/11/02
Dixon, CA 95620-9603	Client Contact: Tim Cook	Date Extracted: 11/11/02
	Client P.O.:	Date Analyzed: 11/12/02-11/19/02

Diesel Range (C10-C23) Extractable Hydrocarbons as Diesel*

Extraction method: SW3510C Analytical methods: SW8015C Work Order: 0211191

Lab ID	Client ID	Matrix	TPH(d)	DF	% SS
0211191-001C	MW-1	W	2200,c	1	99.4
0211191-002C	MW-3N	W	1100,a/m	1	104
0211191-003C	MW-4	W	200,b	1	101
0211191-004C	MW-5	W	2100,c	1	99.2
0211191-005C	MW-6	W	1000,c	1	102
0211191-006C	MW-7	W	240,000,d,b,h	100	120
0211191-007C	MW-8	W	11,000,a,h	1	102
0211191-008C	MW-9	W	150,b	1	100
0211191-009C	MW-10	W	100,b	1	102
0211191-010C	MW-11	W	140,b,i	1	101

Reporting Limit for DF =1; ND means not detected at or above the reporting limit	W	50	µg/L
	S	NA	NA

* water and vapor samples are reported in µg/L, wipe samples in ug/wipe, soil/solid/sludge samples in mg/kg, product/oil/non-aqueous liquid samples in mg/L, and all TCLP / STLC / SPLP extracts in µg/L

cluttered chromatogram resulting in coeluted surrogate and sample peaks, or; surrogate peak is on elevated baseline, or; surrogate has been diminished by dilution of original extract.

+The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified diesel is significant; b) diesel range compounds are significant; no recognizable pattern; c) aged diesel? is significant); d) gasoline range compounds are significant; e) unknown medium boiling point pattern that does not appear to be derived from diesel; f) one to a few isolated peaks present; g) oil range compounds are significant; h) lighter than water immiscible sheen/product is present; i) liquid sample that contains greater than ~2 vol. % sediment; k) kerosene/kerosene range; l) bunker oil; m) fuel oil; n) stoddard solvent / mineral spirit.

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W. A. Craig Inc.	Client Project ID: #3628; Rinehart	Date Sampled: 11/11/02
6940 Tremont Road		Date Received: 11/11/02
Dixon, CA 95620-9603	Client Contact: Tim Cook	Date Extracted: 11/16/02-11/17/02
	Client P.O.:	Date Analyzed: 11/16/02-11/17/02

Oxygenated Volatile Organics by P&T and GC/MS*

Extraction Method: SW5030B | Analytical Method: SW8260B | Work Order: 0211191

Lab ID	0211191-001B	0211191-002B	0211191-003B	0211191-004B	Reporting Limit for DF =1	
Client ID	MW-1	MW-3N	MW-4	MW-5		
Matrix	W	W	W	W		
DF	20	10	3300	400	S	W
Compound	**Concentration**				µg/kg	µg/L
Diisopropyl ether (DIPE)	ND<10	ND<5.0	ND<1700	ND<200	NA	0.5
Ethyl tert-butyl ether (ETBE)	ND<10	ND<5.0	ND<1700	ND<200	NA	0.5
Methyl-t-butyl ether (MTBE)	600	270	84,000	8800	NA	0.5
tert-Amyl methyl ether (TAME)	ND<10	7.1	ND<1700	ND<200	NA	0.5
t-Butyl alcohol (TBA)	ND<100	ND<50	ND<17,000	10,000	NA	5.0
Methanol	ND<10,000	ND<5000	ND<1,700,000	ND<200,000	NA	500
Ethanol	ND<1000	ND<500	ND<170,000	ND<20,000	NA	50
1,2-Dibromoethane (EDB)	ND<10	ND<5.0	ND<1700	ND<200	NA	0.5
1,2-Dichloroethane (1,2-DCA)	ND<10	ND<5.0	ND<1700	ND<200	NA	0.5
Surrogate Recoveries (%)						
%SS:	109	108	106	105		
Comments						

* water and vapor samples and all TCLP & SPLP extracts are reported in µg/L, soil/sludge/solid samples in µg/kg, wipe samples in µg/wipe, product/oil/non-aqueous liquid samples in mg/L.

ND means not detected above the reporting limit; N/A means analyte not applicable to this analysis.

h) lighter than water immiscible sheen/product is present; i) liquid sample that contains greater than ~2 vol. % sediment; j) sample diluted due to high organic content.

DHS Certification No. 1644

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6940 Tremont Road		Date Received: 11/11/02
Dixon, CA 95620-9603	Client Contact: Tim Cook	Date Extracted: 11/16/02-11/17/02
	Client P.O.:	Date Analyzed: 11/16/02-11/17/02

Oxygenated Volatile Organics by P&T and GC/MS*

Extraction Method: SW5030B | Analytical Method: SW8260B | Work Order: 0211191

Lab ID	0211191-005B	0211191-006B	0211191-007B	0211191-008B	Reporting Limit for DF =1	
Client ID	MW-6	MW-7	MW-8	MW-9		
Matrix	W	W	W	W		
DF	500	2500	2000	5	S	W
Compound	**Concentration**				ug/kg	µg/L
Diisopropyl ether (DIPE)	ND<250	ND<1200	ND<1000	ND<2.5	NA	0.5
Ethyl tert-butyl ether (ETBE)	ND<250	ND<1200	ND<1000	ND<2.5	NA	0.5
Methyl-t-butyl ether (MTBE)	11,000	77,000	51,000	61	NA	0.5
tert-Amyl methyl ether (TAME)	ND<250	ND<1200	ND<1000	ND<2.5	NA	0.5
t-Butyl alcohol (TBA)	8600	ND<12,000	ND<10,000	ND<25	NA	5.0
Methanol	ND<250,000	ND<1,200,000	ND<1,000,000	ND<2500	NA	500
Ethanol	ND<25,000	ND<120,000	ND<100,000	ND<250	NA	50
1,2-Dibromoethane (EDB)	ND<250	ND<1200	ND<1000	ND<2.5	NA	0.5
1,2-Dichloroethane (1,2-DCA)	ND<250	ND<1200	ND<1000	ND<2.5	NA	0.5
Surrogate Recoveries (%)						
%SS:	105	100	99.9	110		
Comments		h	h			

* water and vapor samples and all TCLP & SPLP extracts are reported in µg/L, soil/sludge/solid samples in µg/kg, wipe samples in µg/wipe, product/oil/non-aqueous liquid samples in mg/L.

ND means not detected above the reporting limit; N/A means analyte not applicable to this analysis.

h) lighter than water immiscible sheen/product is present; i) liquid sample that contains greater than ~2 vol. % sediment; j) sample diluted due to high organic content.

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W. A. Craig Inc.	Client Project ID: #3628; Rinehart	Date Sampled: 11/11/02
6940 Tremont Road		Date Received: 11/11/02
Dixon, CA 95620-9603	Client Contact: Tim Cook	Date Extracted: 11/16/02-11/17/02
	Client P.O.:	Date Analyzed: 11/16/02-11/17/02

Oxygenated Volatile Organics by P&T and GC/MS*

Extraction Method: SW5030B | Analytical Method: SW8260B | Work Order: 0211191

Lab ID	0211191-009B	0211191-010B			Reporting Limit for DF =1	
Client ID	MW-10	MW-11				
Matrix	W	W				
DF	1	1			S	W
Compound	**Concentration**				ug/kg	µg/L
Diisopropyl ether (DIPE)	ND	ND			NA	0.5
Ethyl tert-butyl ether (ETBE)	ND	ND			NA	0.5
Methyl-t-butyl ether (MTBE)	0.71	15			NA	0.5
tert-Amyl methyl ether (TAME)	ND	ND			NA	0.5
t-Butyl alcohol (TBA)	ND	ND			NA	5.0
Methanol	ND	ND			NA	500
Ethanol	ND	ND			NA	50
1,2-Dibromoethane (EDB)	ND	ND			NA	0.5
1,2-Dichloroethane (1,2-DCA)	ND	ND			NA	0.5
Surrogate Recoveries (%)						
%SS:	108	109				
Comments		i				

* water and vapor samples and all TCLP & SPLP extracts are reported in µg/L, soil/sludge/solid samples in µg/kg, wipe samples in µg/wipe, product/oil/non-aqueous liquid samples in mg/L.

ND means not detected above the reporting limit; N/A means analyte not applicable to this analysis.

h) lighter than water immiscible sheen/product is present; i) liquid sample that contains greater than ~2 vol. % sediment; j) sample diluted due to high organic content.

DHS Certification No. 1644

Edward Hamilton, Lab Director

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QC SUMMARY REPORT FOR SW8021B/8015Cm

Matrix: W WorkOrder: 0211191

EPA Method: SW8021B/8015Cm Extraction: SW5030B BatchID: 4862 Spiked Sample ID: 0211207-003A

Compound	Sample	Spiked	MS*	MSD*	MS-MSD*	LCS	LCSD	LCS-LCSD	Acceptance Criteria (%)	
	µg/L	µg/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	Low	High
TPH(gas)	ND	60	95	94	1.02	103	101	1.98	80	120
MTBE	ND	10	86.2	88.9	3.01	85.2	81	5.09	80	120
Benzene	ND	10	90.5	93.4	3.13	89	84.9	4.71	80	120
Toluene	ND	10	96.1	98.2	2.19	93.9	89.7	4.55	80	120
Ethylbenzene	ND	10	98	100	2.41	95.3	90.6	5.06	80	120
Xylenes	ND	30	99	99.7	0.671	95	94	1.06	80	120
%SS:	103	100	97.8	98.1	0.309	89	86.8	2.53	80	120

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions:

NONE

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

N/A = not enough sample to perform matrix spike and matrix spike duplicate.
NR = analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix or sample diluted due to high matrix or analyte content.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS – MSD) / (MS + MSD) * 2.

* MS and / or MSD spike recoveries may not be near 100% or the RPDs near 0% if: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) if that specific sample matrix interferes with spike recovery.

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QC SUMMARY REPORT FOR SW8015C

Matrix: W WorkOrder: 0211191

EPA Method: SW8015C	Extraction: SW3510C	BatchID: 4865	Spiked Sample ID: N/A

Compound	Sample	Spiked	MS*	MSD*	MS-MSD*	LCS	LCSD	LCS-LCSD	Acceptance Criteria (%)	
	µg/L	µg/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	Low	High
TPH(d)	N/A	7500	N/A	N/A	N/A	92.2	91.9	0.380	70	130
%SS:	N/A	100	N/A	N/A	N/A	96.7	96.1	0.559	70	130

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions:

NONE

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

N/A = not enough sample to perform matrix spike and matrix spike duplicate.
NR = analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix or sample diluted due to high matrix or analyte content.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS – MSD) / (MS + MSD) * 2.

* MS and / or MSD spike recoveries may not be near 100% or the RPDs near 0% if: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) if that specific sample matrix interferes with spike recovery.

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QC SUMMARY REPORT FOR SW8015C

Matrix: W WorkOrder: 0211191

EPA Method: SW8015C	Extraction: SW3510C	BatchID: 4843	Spiked Sample ID: N/A

Compound	Sample	Spiked	MS*	MSD*	MS-MSD*	LCS	LCSD	LCS-LCSD	Acceptance Criteria (%)	
	µg/L	µg/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	Low	High
TPH(d)	N/A	7500	N/A	N/A	N/A	100	95.2	5.30	70	130
%SS:	N/A	100	N/A	N/A	N/A	83.5	82.3	1.35	70	130

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions:

NONE

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

N/A = not enough sample to perform matrix spike and matrix spike duplicate.
NR = analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix or sample diluted due to high matrix or analyte content.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS – MSD) / (MS + MSD) * 2.

* MS and / or MSD spike recoveries may not be near 100% or the RPDs near 0% if: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) if that specific sample matrix interferes with spike recovery.

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QC SUMMARY REPORT FOR SW8260B

Matrix: W WorkOrder: 0211191

EPA Method: SW8260B	Extraction: SW5030B	BatchID: 4822	Spiked Sample ID: 0211126-003A

Compound	Sample	Spiked	MS*	MSD*	MS-MSD*	LCS	LCSD	LCS-LCSD Acceptance Criteria (%)		
	µg/L	µg/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	Low	High
Diisopropyl ether (DIPE)	ND	10	103	104	0.805	99	102	3.23	70	130
Ethyl tert-butyl ether (ETBE)	ND	10	96.8	100	3.32	95.2	98.5	3.44	70	130
Methyl-t-butyl ether (MTBE)	ND	10	95.7	99.5	3.92	93.5	97.6	4.28	70	130
tert-Amyl methyl ether (TAME)	ND	10	91.6	101	9.45	91	100	9.44	70	130
1,2-Dibromoethane (EDB)	ND	10	92.9	100	7.38	95.3	98.7	3.59	70	130
1,2-Dichloroethane (1,2-DCA)	ND	10	94.2	97.7	3.70	94.7	96.7	2.09	70	130
%SS:	110	100	108	110	1.90	106	107	0.277	70	130

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions:

NONE

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

N/A = not enough sample to perform matrix spike and matrix spike duplicate.
NR = analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix or sample diluted due to high matrix or analyte content.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS – MSD) / (MS + MSD) * 2.

* MS and / or MSD spike recoveries may not be near 100% or the RPDs near 0% if: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) if that specific sample matrix interferes with spike recovery.

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QC SUMMARY REPORT FOR SW8260B

Matrix: W WorkOrder: 0211191

EPA Method: SW8260B	Extraction: SW5030B	BatchID: 4864	Spiked Sample ID: N/A

Compound	Sample	Spiked	MS*	MSD*	MS-MSD*	LCS	LCSD	LCS-LCSD Acceptance Criteria (%)		
	µg/L	µg/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	Low	High
Diisopropyl ether (DIPE)	N/A	10	N/A	N/A	N/A	87.2	93.3	6.77	70	130
Ethyl tert-butyl ether (ETBE)	N/A	10	N/A	N/A	N/A	86.3	92.4	6.82	70	130
Methyl-t-butyl ether (MTBE)	N/A	10	N/A	N/A	N/A	76.7	81	5.38	70	130
tert-Amyl methyl ether (TAME)	N/A	10	N/A	N/A	N/A	77.5	87.2	11.9	70	130
1,2-Dibromoethane (EDB)	N/A	10	N/A	N/A	N/A	80.6	84.3	4.50	70	130
1,2-Dichloroethane (1.2-DCA)	N/A	10	N/A	N/A	N/A	80.9	86.2	6.36	70	130
%SS:	N/A	100	N/A	N/A	N/A	107	105	1.35	70	130

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions:

NONE

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

N/A = not enough sample to perform matrix spike and matrix spike duplicate.
NR = analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix or sample diluted due to high matrix or analyte content.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS – MSD) / (MS + MSD) * 2.

* MS and / or MSD spike recoveries may not be near 100% or the RPDs near 0% if: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) if that specific sample matrix interferes with spike recovery.

TRACK

02111 91

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CHAIN OF CUSTODY RECORD

TURN AROUND TIME RUSH ☐ 24 HR ☐ 48 HR ☐ 72 HR ☐ 5 DAY ☑

EDF Required? Yes (circled) / No

Report To:	**Bill To: W. A. Craig, Inc.**
Company: W. A. Craig, Inc.	
6940 Tremont Rd.	
Dixon, CA 95620	**E-Mail: tech@wacraig.com**
Tele: (707) 693-2929	**Fax: (707) 693-2922**
Project #: 3628	**Project Name: Rinehart**
Project Location: Oakland	
Sampler Signature:	

SAMPLE ID (Field Point Name)	LOCATION	SAMPLING Date	SAMPLING Time	# Containers	Type Containers	MATRIX Water	Soil	Air	Sludge	Other	METHOD PRESERVED Ice	HCl	HNO_3	Other
MW-1		11/11/02		5	*	X					X	X		
MW-3N						X					X	X		
MW-4						X					X	X		
MW-5						X					X	X		
MW-6						X					X	X		
MW-7						X					X	X		
MW-8						X					X	X		
MW-9						X					X	X		
MW-10						X					X	X		
MW-11						X					X	X		

Analysis Request	Other	Comments
BTEX & TPH as Gas (602/8020 + 8015)/MTBE: X X X X X X X X X X		
TPH as Diesel (8015): X X X X X X X X X X		
Total Petroleum Oil & Grease (5520 E&F/B&F)		
Total Petroleum Hydrocarbons (418.1)		
EPA 601 / 8010		
BTEX ONLY (EPA 602 / 8020)		
EPA 608 / 8080		
EPA 608 / 8080 PCB's ONLY		
EPA 624 / 8240 / 8260 (Toxy only) X X X X X X X X X X		
EPA 625 / 8270		
PAH's / PNA's by EPA 625 / 8270 / 8310		
CAM-17 Metals		
LUFT 5 Metals		
Lead (7240/7421/239.2/6010)		
RCI		

Relinquished By:	Date:	Time:	Received By:
Clayton Mokai	11/11/02	21:00	
Relinquished By:	Date:	Time:	Received By:
Tucker	11/11	6:30p	Melissa Valles
Relinquished By:	Date:	Time:	Received By:

* = 3 voa & 1 amber

ICE/t° ✓ VOAS ✓ O&G METALS OTHER

GOOD CONDITION ✓ PRESERVATION ✓

HEAD SPACE ABSENT ____ APPROPRIATE

DECHLORINATED IN LAB ____ CONTAINERS ✓

PERSERVED IN LAB ____

McCampbell Analytical Inc.
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CHAIN-OF-CUSTODY RECORD

WorkOrder: 0211191

Client:
W. A. Craig Inc.
6940 Tremont Road
Dixon, CA 95620-9603

TEL: (707) 693-2929
FAX: (707) 693-2922
ProjectNo: #3628; Rinehart
PO:

11-Nov-02

Sample ID	ClientSampID	Matrix	Collection Date	Hold	Requested Tests <>	SW8015C	8021B/8015	SW8260B
0211191-001	MW-1	Water	11/11/02		A	C	A	B
0211191-002	MW-3N	Water	11/11/02			C	A	B
0211191-003	MW-4	Water	11/11/02			C	A	B
0211191-004	MW-5	Water	11/11/02			C	A	B
0211191-005	MW-6	Water	11/11/02			C	A	B
0211191-006	MW-7	Water	11/11/02			C	A	B
0211191-007	MW-8	Water	11/11/02			C	A	B
0211191-008	MW-9	Water	11/11/02			C	A	B
0211191-009	MW-10	Water	11/11/02			C	A	B
0211191-010	MW-11	Water	11/11/02			C	A	B

Comments:

	Date/Time		Date/Time
Relinquished by:		**Received by:**	
Relinquished by:		**Received by:**	
Relinquished by:		**Received by:**	

NOTE: Samples are discarded 60 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

Bottle Type: L-Liter V-Voa S-Soil Jar O-Orbo T-Tedlar B-Brass P-Plastic OT-Other